University of Alberta

ANALYSIS OF THE FACTORS AFFECTING DURATION OF ACUTE INPATIENT HOSPITAL STAYS AFTER HIP AND KNEE ARTHROPLASTY:
A FOCUS ON "MODIFIABLE" AND "NON-MODIFIABLE" DETERMINANTS

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled **"Analysis of the factors affecting duration of acute inpatient hospital stays after hip and knee arthroplasty: A focus on "modifiable" and "non-modifiable" determinants"** submitted by **Maoliosa Donald** in partial fulfillment of the requirements for the degree of **Master of Science**.

Dr. David Magee

Dr. Kerrie Pain

Dr. Doug Gross

Dr. Sharon Warren

April 13, 2007

Date

DEDICATION

I would like to dedicate this book to my family.

My parents who always supported my need to learn, to look at
possibilities not limitations.

Graeme who taught me to take pride in my accomplishments and not to stress
over things you cannot change.

Aidan and Teagan who made me realize what is important in life,
my family!

ABSTRACT

High volumes, long wait times and increasing healthcare expenditures have put pressure on health organizations and institutes to decrease hospital length of stay (LOS) for total joint arthroplasty (TJA) surgery.

The objective of this study was to determine which modifiable and non-modifiable factors best predict length of stay in the acute care hospital setting after total knee arthroplasty and total hip arthroplasty surgery when care is standardized.

Analyses of prospectively collected data from 161 patients included descriptive statistics, univariate statistics and multiple linear regression analysis. Multiple linear regressions identified age, income and the SF-36 mental component summary score as the only predictors of acute care LOS, but they only explained a small amount of variability in LOS. Clinically, to provide patient-centered care, all physiological and psychosocial factors should be evaluated pre-operatively in order to provide appropriate treatment and resource allocation throughout the continuum of care.

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CHAPTER ONE

THE PROBLEM

A. Statement of the Problem

Hip and knee replacements are two of the most common types of elective orthopaedic surgeries (Kreder et al., 2003). The most common indication for surgery is osteoarthritis (OA) and other less widespread indications include rheumatoid arthritis (RA), avascular necrosis, traumatic arthritis, congenital hip conditions and benign or malignant bone tumors (Alberta Bone and Joint Health Institute (ABJHI), 2004). Individuals usually present with functional disability and pain. Medical treatment is mostly symptomatic because there is no evidence of therapies that reverse or halt the progression of osteoarthritis. Total joint arthroplasty (TJA) is an elective surgical option for patients who have not responded to medical interventions. TJA provides excellent outcomes for most patients, with improvement in quality of life and functional status and a decrease in pain (Fortin et al., 1999; Jones, Voaklander, Johnston, and Suarez-Almazor, 2000).

As a response to osteoarthritis amongst other musculoskeletal concerns, the first decade of the 21st century was declared the "Bone and Joint Decade" by 35 nations including Canada and the United States (ABJHI, 2004). In Alberta, the Alberta Bone and Joint Health Institute was launched in March 2004 with a mandate to deliver bone and joint health care, research and education to patients with musculoskeletal disorders in order to reduce hospital stays and waiting times for treatment.

In the Spring of 2005, the Alberta Bone and Joint Health Institute, along with Alberta Health and Wellness and three Alberta Health Regions (Capital, Calgary and Thompson) initiated a study titled "The Alberta Arthroplasty Study". The study's goal was to test a new Arthroplasty Care Model, that was established using evidence-based medicine and best practices that would hopefully improve patient outcomes and decrease health resource utilization, such as hospital length of stay (Appendix A).

High volumes, long wait times and rising health care expenditures have put pressure on health organizations and institutes to decrease hospital length of stay (LOS) for TJA's. Resource consumption for TJA's is mostly a function of type of prosthesis and LOS in hospital (Rissanen & Seppo, 1996). Charges for hospital stay after surgery present at least 20% of the total costs for TJA procedures (Escalante & Beardmore, 1997).

Numerous studies have looked at factors affecting hospital LOS post total knee and/or hip arthroplasty (Brander, Malhotra, Jet, Heinemann and Stulberg, 1997; Del Savio et al., 1996; Epps, 2004; Escalante & Beardmore, 1997; Munin, Kwoh, Glynn, Crossett, and Rubash, 1995). Many of these previous studies have attempted to identify patients who require longer periods of inpatient hospitalization or post acute care options (e.g. sub-acute or rehabilitation unit). The majority of the studies were retrospective cohort designs. An issue associated with retrospective studies includes limitations in the data collection. The data is collected from pre-existing records where the risk of missing observations is common (Altman, 1991). Also, the data base is usually set up for other purposes, not necessarily designed to answer a specific research question.

The aim of this study was to investigate factors affecting acute care hospital LOS and their influence on hospital LOS using data collected prospectively. This study was a sub-study within the previously mentioned Alberta Arthroplasty Study. The independent variables of this sub-study included both "modifiable" and "non-modifiable" factors. Modifiable factors are those that can be controlled, changed and/or prevented by an intervention and/or treatment (e.g. patient motivation, body mass, social support, home environment, functional status and intra and post-operative factors) (Epps, 2004). Non-modifiable factors are those that cannot be controlled, changed and/or prevented by an intervention and/or treatment. These include age, gender, race, comorbidities, and diagnosis (e.g. OA or RA). The dependent variable was acute care hospital LOS measured from patient admit time to discharge time in hours, divided by 24 to obtain days.

B. Objective of the Sub-study

The objective of this sub-study was to determine which modifiable and non-modifiable factors best predict length of stay in the acute care hospital setting after TKA and THA surgery when care was standardized.

C. Research Question

What are the identifiable factors that predict LOS in the acute care setting for TKA and THA when care is standardized?

D. Definition of Terms

Factors: Physiological and psychosocial characteristics that could affect desired outcomes (Epps, 2004).

Acute Care Hospital: An acute care hospital is a facility that provides short term medical treatment for patients having an acute illness or injury or recovering from surgery (*The American Heritage® Dictionary of the English Language*, 2004). Patients in this sub-study attended a Calgary facility with 37 inpatient orthopaedic beds. The facility has key clinical, surgical and inpatient medical and rehabilitation services.

Primary total hip arthroplasty (THA): Procedure to replace all of the original hip joint with a prosthesis. The hip prosthesis consists of three parts: 1) a cup that replaces the acetabulum; 2) a metal/ceramic ball that replaces the head of femur; 3) a metal stem that is inserted into the shaft of the femur to add stability to the prosthesis (Campbell, 1987).

Primary total knee arthroplasty (TKA): Procedure that replaces the original knee surfaces (tibial and femoral) with a prosthesis. The three parts of the prosthesis are implanted onto the end of the femur, the tibia and undersurface of the patella (Campbell, 1987).

Modifiable factors: For the purpose of this study, modifiable factors were defined as factors that may be controlled, changed and/or prevented by an intervention and/or treatment.

Non-modifiable factors: For the purpose of this study, factors that could not be controlled, changed and/or prevented by an intervention and/or treatment.

Length of Stay (LOS): Patient admit time to the discharge time in hours divided by 24 to give the number of days.

Alberta Arthroplasty Study: A randomized controlled prospective study to examine the effectiveness of a new evidence-based arthroplasty care model for patients with severe degenerative joint disease of the hip or knee in Alberta.

Arthroplasty Care Model: A standardized care model tested by The Alberta Arthroplasty Study. The model was based on best available evidence (Appendix B).

Sub-study patients: Consented patients who had been randomized into the intervention group, by the Alberta Bone and Joint Health Institute requiring THA or TKA and had attended the Alberta Hip and Knee Clinic located in Calgary, Alberta.

Alberta Hip and Knee Clinic: Located in Calgary, Alberta staffed with orthopaedic surgeons, nursing and rehabilitation staff.

Patient Outcomes: Final status of a patient. Changes in status could include factors such as pain, function, and mobility.

Comorbidities: For the purposes of this study, they were coexisting medical conditions that exist before surgical intervention.

Hip Resurfacing (Birmingham Hip): Metal on metal hip resurfacing originally developed by Dr. McMinn, orthopaedic surgeon from Birmingham, United Kingdom. The surgical procedure involves fitting the femoral head with a metal surface as well as lining the acetabulum with a metal cup (ABJHI, 2004).

Unicondylar Knee Arthroplasy (Partial knee replacement): Surgery involves reshaping the damaged surfaces of the knee only and replacing the damaged surfaces with metal and plastic components (Campbell, 1987).

E. Limitations of the Sub-study

This sub-study was limited to:

1. Patients receiving their first total joint arthroplasty. Joint replacement revision is usually more complicated than an initial (primary) joint surgery. The operating room (OR) time is longer and sometimes requires removal of surrounding bone and tissue (Campbell, 1987).

2. Only data for a patient's first arthroplasty was used. If patients received two joint replacements over the course of the study; the data from later replacements was not used. This is to ensure no comparing of subsequent surgery to the first arthroplasty.

3. Patients in the intervention group of the larger study. These patients received the evidenced-based, standardized arthroplasty care model. This ensured that treatment and discharge criteria were consistent for each patient throughout the acute inpatient stay.

F. Delimitations of the Sub-study

This sub-study was delimited to:

1. Patients with osteoarthritis and therefore conclusions regarding other diagnostic groups (e.g. RA) cannot be made.

G. Ethical Considerations

As previously mentioned, this study was a sub-study of The Alberta Arthroplasty Study, which had received ethics approval by the Health Research Ethics Board, Edmonton, Alberta (Appendix C) and the Conjoint Health Research Ethics Board, Calgary, Alberta (Appendix D). Ethics approval was also obtained for this sub-study from the Health Research Ethics Board (Appendix C) and the Conjoint Health Research Ethics Board (Appendix D). All patients involved in The Alberta Arthroplasty Study had read and signed a consent form prior to the randomization process (see Appendix E) which included and explained the purpose of the larger study and procedures and data collection involved. The consent for the larger study also informed patients that non-identifiable data could be used for related studies such as this sub-study. The data consisted of patient identification numbers, with no names attached. Data collection, storage and security were the responsibility of the Alberta Bone and Joint Health Institute. The analysis of non-identifiable data posed no direct physical or mental risk to the patients of this sub-study.

CHAPTER TWO

LITERATURE REVIEW

With aging populations and technological advancements, there will be continual demand for total joint arthroplasties. This growth triggers pressures to decrease the TJA wait times for surgery, reduce system costs and decrease hospital LOS (Epps, 2004).

This literature review looked at physiological and psychosocial factors that could be used to predict acute care hospital LOS. These modifiable and non-modifiable factors can be categorized into: 1) patient factors; 2) clinical factors; 3) treatment factors (Epps, 2004).

	Modifiable Factors	**Non-modifiable Factors**
Patient Factors	• Social Support • Home Environment • Motivation	• Age • Gender • Race • Income
Clinical Factors	• Body Mass • Nutrition • Functional Status	• Comorbidity • Diagnosis
Treatment Factors	• Intra Operative • Post Operative	

Table 1: Physiological and psychosocial factors used to predict hospital length of stay

A. Patient Factors

Patient factors are pre-existing states/traits that a patient possesses before joint replacement surgery. The following are considered patient factors and can be categorized as either modifiable or non-modifiable.

i) Age

Age has been frequently evaluated to determine its impact on outcome following TJA. With dramatic gains made in life expectancy, more people are living into their eighth and ninth decades of life, fueling some of the increased demand for these procedures. Brander et al. (1997) found no significant differences in LOS between younger and older matched groups of total hip and total knee patients. Conversely, Rissanen & Seppo (1996) found that older patients had longer LOS for many hospital procedures including THA's. Others have found that LOS increased by more than one day for every quintile increase in age for subjects with RA having a TJA (Escalante & Beardmore, 1997). Thus, the results are contradictory, so there are no clear conclusions regarding age as a predictor of hospital LOS. This difference could be due to the types of patient populations studied by these researchers (osteoarthritis versus rheumatoid arthritis).

ii) Gender

Studies have found that females had a longer LOS than males following TJA (Kwoh, Whitley, Azvadak, Venglish, and Gibson, 1993; Wolfe, Nietfeld, Hedrick, McElrath, and Ross, 1993). Rissanen and Seppo (1996) found that being female predicted an increased LOS, but these researchers questioned this finding by stating that older females tended to be widows and thus lived alone.

They postulated that if a patient lived alone, discharge could be delayed until the patient was safe and independent with functional activities and activities of daily living (ADL). If a patient has support at home then he or she could be discharged sooner. Thus, social support may be a more relevant indicator than gender for determination of LOS.

iii) Social Support

Social support has been defined as those resources in a person's environment that enable him or her to deal with life's physical and psychological stresses. Munin et al. (1995) looked at TJA patients' living status (i.e. live alone or with someone else) as a predictor of discharge outcome, but not hospital LOS. Others have studied arthroplasty patients and looked at marital status (Lin & Kaplan, 2004; Sharma et al., 1996). They categorized marital status as married or unmarried. The unmarried group included separated, divorced, never married and widowed patients. They found that unmarried status was a significant factor for determining LOS. In contrast, Rissanen and Seppo (1996) found that living arrangements (i.e. home or institution) did not predict, or correlate, with LOS. Differences in findings could be attributed to the researchers' identification and labeling of social support.

iv) Home Environment

The only study that clearly identified home environment as a factor was performed by Munin et al. (1995). They looked at home environment including number of stairs to enter the home and the location of the patient's bedroom. Their findings indicated that home environment was not statistically significant.

This study only researched home environment as a predictor of discharge location not hospital LOS.

v) Motivation

Motivation is a critical problem in exercise rehabilitation programs that require adherence to a set protocol. Merkle, Jackson, Zhang, and Dishman (2002) reported a 50 – 60% dropout rate from rehabilitation programs within the first three to six months. Studies of motivation have focused on fitness programs, cardiac recovery and rehabilitation, and pulmonary rehabilitation (King, Humen, Smith, Phan, and Teo, 2001; Resnick, 1995). It has been shown that there is a relationship between self-motivation and the adherence to an exercise program (Annesi, 2002; Dishman & Ickes, 1981; King et al., 2001). Annesi (2002) reports that exercise related self-efficacy and a person's past experience with physical activity are positively associated with adherence to an exercise program. Self-motivation may offer an effective basis for predicting perseverant behavior in patients who have TJA's. Patients who are highly motivated may adhere to post-operative exercises and in turn meet discharge criteria sooner. There have been no studies involving motivation as a predictor of acute hospital LOS.

vi) Race

There are studies that look at race/ethnic disparity in rates of TJA and found differences between African-American and Caucasions in the utililization of TJA care in the United States (U.S.) (Ibrahim, Siminoff, Burant, and Kwoh, 2002). African-Americans had low rates for a TJA. Another study found similar findings with minorities such as Hispanic and African-Americans in the United States

(Dunlop, Song, Manheim, and Chang, 2003). Weaver et al. (2003) identified race as a predictor of LOS, with non-whites having an extended LOS. There are no Canadian studies available that looked at race and joint replacements.

vii) Income

Income has been studied by collecting data on socioeconomic classes or type of insurance a patient possesses. The results showed that lower socioeconomic classes use less pre-operative assistance and delay in seeking and receiving total hip replacements, but there was no effect on recovery of function following THR (Visuri & Honkanen, 1982). Another study, carried out in the United States concluded that patients with lower incomes had shorter LOS than those patients with higher incomes (Weaver et al., 2003). A study done in Finland compared LOS between TJA's done in public and private hospitals and found the LOS to be less in the public hospital (Rissanen & Seppo, 1996). There are no known Canadian studies that have looked at income as a predictor of LOS.

B. Clinical Factors

Clinical factors include pre-operative physical status indicators such as the following.

i) Comorbidity

Comorbidity is defined as a coexisting medical condition that exists before surgical intervention or hospital admission (see Appendix F). Patients who are medically and musculoskeletally debilitated consume more resources and increase hospital costs (Wasielewski, Weed, Prezioso, Nicholson, and Puri, 1998) . The

Wasielewski study found that TKA's with equal to or greater than four comorbidities had poorer scores on the Medical Outcomes Study 36 Item Short-Form Health Survey (SF-36). Kwoh et al. (1993) found that equal to or greater than 2 comorbidities increased LOS. Types of comorbidities such as atherosclerotic heart disease, lupus erythematosus and renal disease were predictive of longer LOS with total hip arthroplasty. Del Savio (1996) found that diabetes mellitus correlated significantly with increased LOS for TJA patients. Conversely, Brander et al. (1997) found that the number of comorbidities was not predictive of hospital LOS in patients undergoing TJA. This study only included persons over 80 years of age. Mixed conclusions are drawn from these studies regarding types of comorbidities or number of comorbidities and their influence on hospital LOS. Comorbidities have been analyzed in other areas of medicine using the Chronic Disease Score (CDS). Putman et al. (2002) tested the CDS and found that it predicted hospitalization and could be useful as an indicator of baseline comorbidity. The CDS is a risk adjustment tool based on age, gender and the history of dispensed drugs (Putman et al., 2002). It helps to address the limitations involved in analyzing the number of diagnoses recorded or the misclassification of comorbidity. There are presently no arthroplasty studies that have used this as a measure of comorbidity.

ii) Body Mass

Body mass is recorded as body mass index (BMI). BMI was defined by Deshmukh, Hayes, and Pinder (2002) as the ratio of body weight over height squared and is an indicator of total body adiposity, relevant to height. BMI is a relevant factor because increased BMI can increase joint stress. BMI did not predict LOS in acute care for TKA according to Kwoh et al. (1993) and Forrest et al. (1998). Lin and Kaplan (2004) also found no correlations between BMI and inpatient rehabilitation unit LOS. In contrast, results for THA showed that obesity was an independent predictor for discharge to an inpatient rehabilitation facility (de Pablo et al., 2004). Obesity has been considered an adverse influence and associated with increased peri-operative and post-operative morbidity (Deshmukh et al., 2002). Many patients are advised against having surgery because the results could be less than optimal (Hawker et al., 2006).

iii) Diagnosis

Kwoh et al. (1993) and Escalante and Beardmore (1997) both found that OA patients had a shorter LOS than RA patients. These authors attribute this LOS increase to other factors associated with RA, such as prolonged OR time, disease severity, positive rheumatoid factor and post-operative wound complications.

iv) Nutrition

Nutritional status has been assessed by pre-operative levels of serum albumin, total protein, total lymphocyte count (TLC), calcium, hematocrit and hemoglobin (Del Savio et al., 1996). There are many studies that look at nutritional status of general surgical and medical patients, but there are few studies that look at this as a predictor of LOS in TJA patients. Del Salvio et al. (1996) found that patients who underwent total hip arthroplasty and who had an albumin level of less than 3.9g/dL were twice as likely to have an increased LOS. Similar results with serum albumin and TLC correlated with increase LOS in those who underwent TJA (Lavernia, Sierra, and Baerga, 1999).

v) Health Status

Fortin et al. (1999) stated that historical orthopaedic practice has been to delay surgery until pain and functional limitation are intolerable. The delaying of surgery results in muscle deconditioning, loss of mobility, and lack of exercise which could compromise surgical benefit (Fortin et al., 1999). Young, Cheah, Waddell, and Wright (1998) discussed that evidence of good pre-operative function appears to improve likelihood of good post-operative function. There is no known literature that determines if health status pre-operatively predicts hospital LOS.

C. Treatment Factors

Treatment factors are intra-operative or post-operative effects that happen as a direct result of the surgical intervention.

i) Intra-operative

These include type of anaesthetic, blood loss and length of time in surgery. Epps (2004) stated that there were no significant effects of these above mentioned intra-operative factors on LOS for TJA.

ii) Post-operative

The rate of serious medical complications, such as myocardial infection, pneumonia, pulmonary embolus, renal failure is reported to be less than two percent (Forrest et al., 1998). The rate of local complications, such as peripheral nerve injury, wound infection and peri-prosthetic failure has been reported to be less than five percent (Forrest et al., 1998). Escalante & Beardmore (1997) did note that early wound complications resulted in prolonged LOS in THA/TKA patients with the diagnosis of RA.

C. Standardized Care Model

Diminishing resources and fiscal restraints have lead to the need to improve efficiency and use of resources without compromising clinical outcomes for TJA. To address this, many orthopaedic departments have turned to practice guidelines or clinical pathways (Gregor et al., 1996). These are standardized care models that define the process of patient care, in order to ensure that optimal quality care is provided. They address variability in the care processes and practice patterns. Standardized care models allow early detection of problems in a timely, evidence-based manner versus the historical management of TJA, where care is provided based on reacting to issues, which delays discharge and increases acute care LOS.

The Alberta Arthroplasty Study examined the effectiveness of an evidence-based arthroplasty care model for patients with degenerative joint disease of the hip and knee. The model addressed care and interventions across the continuum of care, specifically pre-operative assessment and preparation, in-patient medical and physical needs and post-operative treatment and service access. The evidence-based model addressed variability in approaches at each of the stages in the continuum in order to provide positive patient outcomes.

E. Summary

Studies of the impact of patient, clinical and treatment factors on hospital LOS have yielded mixed results. The majority of the research has looked at non-modifiable factors versus the potentially modifiable ones.

The apparent weaknesses in the research reviewed included the following:

1. Many studies were retrospective and relied on recorded data with no validation or verification of data.
2. TJA post-operative care models were either not described in the studies or if present, they were not standardized or evidence-based.
3. Many studies used different operational definitions for collecting data on similarly named variables (e.g. social support could be living status or marital status).
4. Many studies looked at "older adults", greater than 60 years of age versus all ages.

Despite the available literature on predictive factors for TJA LOS, it is surprising that so little research has actually been conducted specifically on modifiable factors. This sub-study investigated these factors, along with non-modifiable factors and attempted to avoid the weaknesses that have been noted above from past research.

CHAPTER THREE

METHODS AND PROCEDURES

The objective of this sub-study was to determine which modifiable and non-modifiable factors best predict LOS in the acute care setting after TKA or THA surgery when care was standardized.

A. Subjects

The sub-study sample consisted of Calgary THA and TKA patients, from the larger Alberta Arthroplasty Study, who were randomized into the intervention group (i.e. those receiving the standardized, evidence-based care model) and met the inclusion criteria for this sub-study. Patients were under the care of eight orthopaedic surgeons.

B. Sample Size

For this sub-study, a sample size of 150 was required for the probability of Type I error to be 5% and a power of 80% in the regression analysis. (Refer to Appendix G for calculations to obtain this value). The Alberta Arthroplasty Study in Calgary collected information on a sample size of 500 subjects for the intervention group. Of these 500 patients, only 161 patients met the inclusion criteria required for this sub-study. The most common causes for exclusion were the diagnosis of rheumatoid arthritis and not completing the Self Motivation Inventory.

C. Inclusion Criteria

For the purposes of this sub-study, the inclusion criteria were:

1. Male or female patients.
2. Diagnosis of osteoarthritis.
3. Patients requiring primary (first time) total hip or knee arthroplasty.
4. Patients who received the Self Motivation Inventory (SMI – short form).

D. Exclusion Criteria

For the purposes of this sub-study, the exclusion criteria were:

1. Patients requiring hip resurfacing (Birmingham hip) or unicondylar knee arthroplasty.
2. Patients requiring simultaneous bilateral joint replacement.
3. Patients requiring hardware removal or requiring an additional surgical procedure related to, but in addition to, a primary hip or knee replacement.
4. Patients in the control group of the larger study (i.e. those patients who did not receive the standardized, evidence-based arthroplasty care model).

E. Study Design

The sub-study design was an observational cohort, analyzing prospectively collected data by the Alberta Bone and Joint Health Institute. A well established, rich data base was designed by experts and health care professionals, including the author prior to ethics approval for this sub-study. Age, gender and type of surgery were collected by medical office assistants (MOA's). Medications, BMI, social support/living status, and home environment were collected by either nursing or rehabilitation staff. Patients completed the motivation questionnaire (Self Motivation Inventory - SMI), Western Ontario McMaster Osteoarthrits Index (WOMAC) and Medical Outcomes Study 36 Item Short-Form Health Survey (SF-36). All data was collected prior to surgery at the Alberta Hip and Knee Clinic, Calgary, Alberta. Because this was part of a larger study, great care was taken to ensure accuracy and completeness of the data. Permission for the analysis of data was granted by the eight participating orthopaedic surgeons (Appendix H). Application procedures for approval by the Alberta Bone and Joint Health Institute were completed and approval was granted (Appendix H). An Oath of Confidentiality Security was signed between the Alberta Bone and Joint Health Institute and author (Appendix I).

F. Data Collection

i) Variables

The dependent variable was hospital length of stay measured from patient admit time to discharge time, divided by 24 to obtain LOS in days.

The independent variables included demographics, social factors, medical and health status measures that have questionable effects on LOS. Specifically, these included the following:

1. **Age** – was collected in years and analyzed as a continuous variable. Past research has been geared to those patients older than 65, but recent statistics have found people in their 40's are experiencing severe pain and disability, therefore, no age limits were set (Canadian Joint Replacement Registry (CJRR), 2006; Rankin et al., 2003). It is important to include all ages in order to avoid selection bias inherent in studying only those persons who are older than age 65.
2. **Gender** – male or female. Osteoarthritis is seen in both males and females in a 3:2 female/male ratio (Escalante & Beardmore, 1997).
3. **Type of surgery** – total hip or total knee. Both types of arthroplasty were studied in order to allow greater generalizability of results.
4. **Chronic disease score (CDS)** – was used to measure comorbidity and was measured as a continuous variable. The CDS was developed to test the feasibility of using a pharmacy database to measure chronic disease status (Von Korff, Wagner, and Saunders, 1992). Von Korff et al. (1992)

reported that it was created by a panel of health care professionals. A consensus decision was used to classify medications that should be included in the score and how they should be weighted to correspond to various disease complexities and severities. The CDS provided empirically derived weights for each of three outcomes: total cost, outpatient cost, and primary care visits (Clark, Von Korff, Saunders, Baluch, and Simon, 1995). It has been validated for use as a predictor of physician-rated disease status, self-rated health status, hospitalization and mortality (McGregor et al., 2005). Clark et al. (1995) recommended using total cost weights as the outcome measure. Scoring is in total cost (dollars) and ranges from zero dollars to thousands of dollars. McGregor et al. (2005) stated that using a single aggregate measure provided greater utility and it is often difficult to include several comorbid conditions in one statistical model without over-fitting. Putman et al. (2002) stated that comorbidity adjustment based on medication has been used to control for potential confounders. It was chosen by the larger provincial study for these reasons as the best tool to record an individual's comorbidity status.

5. **Body Mass Index (BMI)** – was recorded pre-operatively and analyzed as a continuous variable. A normal range for BMI is between 19 to 24.9 (Deshmukh et al., 2002). BMI is well suited for the purpose of determination of adiposity because it is closely correlated with body mass, and poorly with height. It avoids misleading conclusions of obesity based solely on weight without considering height (Deshmukh et al., 2002).

6. **Social support/Living status** – Data regarding whether a patient received care by others to help them at home. Patients were to answer yes if they receive care from any of the following: family member, homecare, living in a nursing home or other and no if they received no care.
7. **Income** – The choices for household income were the following categories: low (< $40,000), medium ($40,000 to $80,000) and high ($ >$80,000).
8. **Marital status** – Patients were to answer yes if they were married, partner/common law and no if they were single/not ever married, separated, divorced, or widowed.
9. **Home environment** – Information on home environment was collected by having patients answer yes or no to the following questions: 1) Do you need to climb stairs to enter the home? 2) Is your bedroom on the main floor?
10. **Self Motivation Inventory (SMI) short version – 10 items** (Appendix J). Pre-operative scores were collected and analyzed. It is a self administered tool designed by Dr. Dishman from the original SMI that included 40 phrases (Dishman & Ickes, 1981). The SMI short version consists of 10 items using a 5 point scale with anchors 1: very unlike me and 5: very much like me. The total score is calculated by summing the individual responses. It provides a reliable and valid measure of self-motivation (Beencke, n.d.). Dishman (2005) and Merkle et al. (2002) found a high correlation with other measures of self-motivation and high test-retest

reliability (0.91). Dr. Dishman has evaluated 5 data sets (students and army personnel) looking at factorial validity, factorial invariance and internal consistency and construct validity of the 10 item SMI. The unpublished data indicated strong evidence of internal consistency based on values of coefficient alpha that all exceed 0.70 (Dishman, 2005). Construct validity of scores was estimated using Cronbach's coefficient alpha and was found to be 0.88 when compared to scores from other theoretically-relevant constructs (e.g. self-esteem and social physique anxiety). Dr. Dishman has provided written permission to use the 10 item SMI (Appendix K). This outcome measure was chosen because it is easy to administer and has been used by Sharma et al. (1996) to look at motivation and functional outcome in patients after total knee arthroplasty, but not hospital LOS. There are no other known tools for testing this variable with the TJA population.

11. **Western Ontario McMaster Osteoarthritis Index (WOMAC)** – (Appendix L) Pre-operative scores were analyzed. The WOMAC is a multidimensional, disease specific, self administered health status instrument that takes about 15 minutes to complete. It consists of a series of Likert five point scales that assess pain, stiffness, and physical function (Finch et al., 2002). The total raw score is obtained by summing the individual scores, to obtain a range of scores from 0 to 100, with low scores indicating better outcome. The reliability, internal consistency and validity have been tested in clinical trials of anti-inflammatory drugs as

well as hip and knee arthroplasty studies (Bellamy, Buchanan, Goldsmith, Campbell, and Stitt, 1988). Bellamy and Buchanan (1986) in a previous study, found internal consistency to be greater than 0.85 and a strong correlation between perceived importance of pain and function (r = 0.74) for construct validity. This valid and reliable measure has been extensively used to evaluate this patient population (Bellamy et al., 1988; Jones, Voaklander, and Suarez-Almazor, 2003).

12. **Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)** (Appendix L) – Pre-operative scores were analyzed. The SF-36 is a widely used, self administered, multi-purpose, short form health survey with 36 questions. It was designed as an indicator of perceived health status. The SF-36 has been useful in identifying "at risk" individuals, along with evaluating the effectiveness of different treatments. It yields an eight scale profile of functional health and well being scores as well as psychometrically based physical and mental health summary measures and a preference based health utility index (Finch et al., 2002). The raw summary scores for the two summary measures: physical component summary (PCS) and mental component summary (MCS) were recorded, with higher scores indicating a better health status. Studies to date have shown concurrent, criterion, construct and predictive evidence of SF-36 validity. Reliability estimates with patients with arthritis have an internal consistency 0.75 to 0.91using Cronbach's alpha (Finch et al., 2002). Construct validity has been demonstrated with high correlations with

similar dimensions of other scales (e.g. Nottingham Health Profile and VAS Pain scale) (Finch et al., 2002). This tool was chosen because it has been used widely with general populations, including osteoarthritis.

Both the WOMAC and the SF-36 were used to measure a patient's health status, specifically perceived mental and physical limitations.

The scope of this sub-study did not investigate treatment factors such as surgical time and post-operative complications. Epps (2004) studied clinical, patient and treatment factors and found that treatment factors were poorer predictors than clinical and patient factors. Collins, Daley, Henderson, and Khuri (1999) also found pre-operative patient characteristics were stronger predictors than intra-operative or post-operative factors for prolonged length of stay.

ii) Demographic Information

Demographic information included age, gender, marriage and income. To increase the generalizability of the findings to hip and knee arthroplasty patients outside of this sub-study, a review of available demographic data from the Canadian Joint Replacement Registry (CJRR) was performed to ensure that sample representation had been obtained.

G. Statistical Analysis

Statistical Package for Social Sciences (SPSS, version 14.0) was used to perform the statistical analysis. Demographic data was characterized using descriptive statistics including measures of central tendency (e.g. mean) and dispersion (e.g. standard deviation) as appropriate to the level of measurement.

Various statistical methods were used based on whether the data was categorical or numerical in nature. For categorical data Chi-square tests were used and for numerical data independent t-tests for two groups and one-way ANOVA for greater than two groups. For example, t-tests and one-way ANOVA were used to determine if differences existed between THA/TKA, gender, marital status, social support, home environment, and household income and their mean LOS. To determine if there was an association between marital status and social support Chi-square test was used. To determine the relationships between the continuous variables correlation analysis was used. Specifically, Pearson correlation coefficient was used to investigate the inter-relationships among variables such as LOS, SMI, SF-36, age, BMI, WOMAC, and CDS.

Multiple linear regression was used to examine distribution of data to verify that each predictor variable had sufficient variance. It allowed the researcher to estimate how much of the total variance could be explained by one or a combination of sources (Altman, 1991). Four different regression models were entered for exploratory purposes to investigate possible relationships when inputs were modified in terms of level of significance, number of factors and the effect of the outliers. Variable sets entered into the multiple linear regression analysis: 1) all modifiable and non-modifiable factors simultaneously- full model; 2) backward elimination (significance level ≤ 0.1); 3) modifiable factors only; 4) all modifiable and non-modifiable factors with outliers removed.

Data entry was performed by the Alberta Bone and Joint Health Institute. Categorical data was assigned codes (i.e. single coded variables – 0 = no and 1 = yes). Numerical data was entered with the same precision as the measurement tool (e.g. chronic disease score in Canadian dollars) (Appendix M).

Data checking/cleaning was done by the Alberta Bone and Joint Health Institute in the following manner. The data base was programmed to generate reports that identified missing variables or specific out-of-range data. All data collected was double keyed and validated. Patients were contacted for missing data variables. For patients who preferred not to report their household income, values were obtained by linking postal code with Canadian census data.

CHAPTER FOUR

RESULTS

A. Descriptive Statistics for Modifiable and Non-modifiable Factors

Data checking for this sub-study indicated that there were missing values on six patients for the social support/living status variable and four patients for the home environment variable. The missing values resulted from incomplete questionnaires. Information regarding these data variables was available and collected from other standardized charting documents on the inpatient chart and the missing values were entered appropriately. A total of 161 patients were obtained for the analysis in this sub-study, all with complete data. Descriptive data is presented according to previously mentioned categories: patient factors and clinical factors.

i) Patient Factors

Of the 161 patients, 109 (67%) patients were women and 52 (33%) were men. Their age ranged from 44.77 years to 84.99 years, with the average age being 68.91 (*SD* = 8.91) years old.

One hundred and four (64%) of the patients were in the low household income range (<$40,000), with 48 (30%) in the medium household income range ($40,000 to $80,000). Only 9 patients (6%) recorded their household income being greater than $80,000.

One hundred and thirteen (70%) of the patients were married. Social support data indicated that 129 (80%) of the patients did not receive any support from a family member or outside agency prior to surgery.

Data regarding home environment showed that 121 (75%) of patients had a bedroom on the main floor and that 131 (81%) of the sub-study patients had stairs to enter their home.

The SMI short version raw scores ranged from 14 to 50, with a mean of 44.19 (*SD* = 5.04). The total score was obtained by adding the individual scores from each of the ten questions, 50 points being the optimal raw score. The mean value in this sub-study population indicated that patients were highly motivated.

The SF-36 mental component summary (MCS) raw scores ranged from eight to 30 with a mean of 23.63 (*SD* = 4.21). The normal range of raw scores for this measure is from five to 30 (Ware et al., 1994). According to Ware, a mean score of approximately 24 would indicate a more stable mental health status demonstrated by a positive affect, minimal psychological distress and emotional problems. Table 2 summarizes the descriptive data for patient factors.

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Table 2: Descriptive statistics for patient factors (n = 161)

Patient Factors	Number	Percentage*
Age		
40 – 59	32	20
60 – 69	41	25
70 – 79	77	48
> 80	11	7
Gender		
women	109	67
men	52	33
Income		
low	104	64
medium	48	30
high	9	6
Social Support/Living status		
Receives support:		
yes	32	20
no	129	80
Marriage		
yes	113	70
no	48	30
Home Environment		
Stairs to enter home:		
yes	131	81
no	30	19
Bedroom main floor:		
yes	121	75
no	40	25

* Percentages are rounded to the nearest whole number.

ii) Clinical factors

There were 108 patients (67%) for knee arthroplasty and 53 patients (33%) for hip arthroplasty. The mean BMI for this sub-study population was 28.40 (*SD* = 4.78), which is considered as being overweight (BMI: 25.0 to 29.9). Only 36 (22%) patients were considered within the normal range (BMI: 18.5 to 24.9) (Deshmukh et al., 2002). Forty-four (27%) patients were considered to be obese

(BMI: > 30) and two patients (1%) were morbidly obese (BMI: ≥ 40).

The CDS mean for this sub-study population was 2664.65 (*SD* = 2030.12) with scores ranging from zero to 8466.8. Higher scores indicate more comorbidity as measured by the CDS (MacKnight & Rockwood, 2001).

WOMAC scores ranged from three to 96, with low scores indicating better function. The SF-36 scores ranged from 10 to 29, with higher scores indicating better function. The normal raw scores for this measure range from 10 to 30. Table 3 summarizes the descriptive statistics for clinical factors.

Table 3: Descriptive statistics for clinical factors (n=161)

Clinical Factors	(min, max)	Mean	Standard Deviation
Body Mass Index	19.94, 43.71	28.40	4.78
Chronic Disease Score	0, 8466.8	2664.65	2030.12
WOMAC	3, 96	51.26	6.50
SF-36 PCS	10, 29	15.94	4.25

B. Descriptive Statistics for Length of Stay (LOS)

The dependent variable was hospital length of stay measured from patient admit time to discharge time and divided by 24 to obtain the value in days. The LOS for this sample ranged from 2.08 to 6.21, with a mean LOS of 3.84 days (*SD* = 0.73). The majority of the patients (i.e. 75%) were discharged within 4.19 days. Hip arthroplasty patients averaged 3.90 days versus knee subjects 3.81 days and this was not statistically significant (*p* = 0.49). Table 4 summarizes the descriptive data for LOS. Figure 1 represents a histogram of the length of stay at the acute care hospital site. LOS was not normally distributed, demonstrated by the right skewed distribution (skewness = 0.68). Data screening revealed four outliers as demonstrated by Figure 2. The four outliers were patients who had a LOS greater than six days.

Table 4: Descriptive statistics for acute care length of stay (n=161)

Factors	LOS (days)
Gender	
women	3.93
men	3.64
Income	
low	3.93
medium	3.70
high	3.41
Social Support/Living status	
Receives support:	
yes	4.06
no	3.78
Marriage	
yes	3.79
no	3.94
Home Environment	
Stairs to enter home:	
yes	3.85
no	3.77
Bedroom main floor:	
yes	3.87
no	3.73

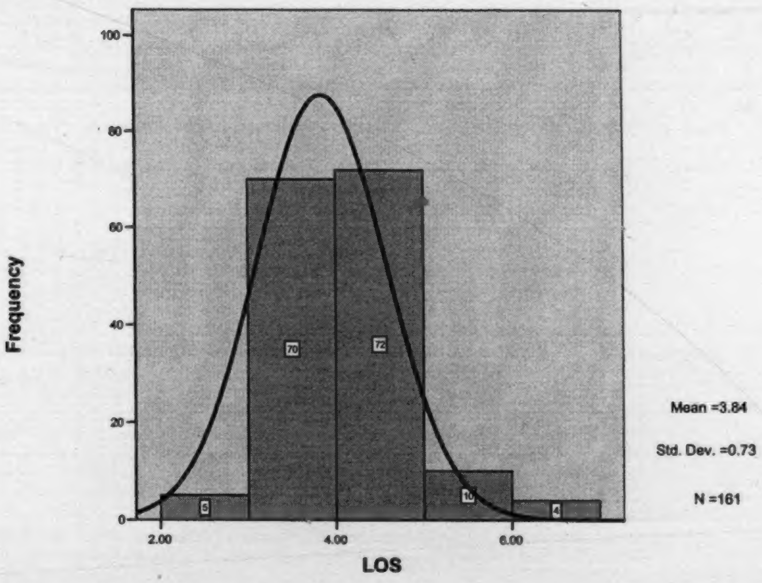

Figure 1: Histogram of the acute care length of stay. (*Std Dev- standard deviation*)

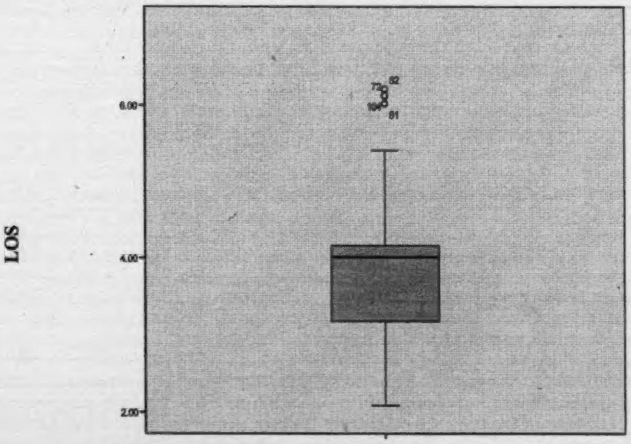

Figure 2: Box plot of length of stay.

An analysis of LOS, including and excluding the four values, was performed and there was no difference in the LOS results (i.e. mean LOS for both was 3.84). Since the outliers had no effect they were not removed for the regression analysis.

A chart audit was performed to find the clinical rational for the extended LOS and for all four patients, it was due to post-operative complications.

C. Univariate Statistics

In order to determine if there were differences between types of surgery, gender, marital status, social support, and home environment in relation to acute care LOS, two-tailed t-tests were used with a 0.05 level of significance. The LOS data for hip and knee arthroplasty patients was not statistically significant ($\underline{p} = 0.49$) allowing the data to be pooled together for the regression analysis which increased the power of the study. There was a statistically significant difference ($p = 0.05$) between male and female LOS (3.64 and 3.93 respectively). The LOS for married patients was 3.79 days and for unmarried patients was 3.94 days. The results indicated that there was no statistical difference between the two groups ($p= 0.23$). Patients who received no social support stayed on average, 3.78 days and those who had support stayed 4.06 days. These differences were not statistical significant ($p = 0.24$). Home environment was not statistically different for the following elements; stairs to enter home or location of bedroom. It was noted that patients who had a bedroom on the main level of their home stayed longer than those who did not (i.e. 3.87 days versus 3.73 days respectively) ($p = 0.17$). Patients who had stairs to enter home stayed 3.85 days versus those patients with no stairs 3.77 days ($p = 0.82$).

To evaluate if there was any difference in LOS among the three household income categories, a one-way ANOVA (0.05 level of significance) was used. Findings indicated that there was a significant difference in LOS for the three income groups (i.e. low, medium and high income) and LOS ($F = 4.08, p = 0.02$). Post-hoc comparisons indicated that there was a significant difference between the low and high income patients and LOS ($p = 0.01$). The mean difference between the low and high household income groups was 0.60 with a standard error of 0.16.

To determine the association between marital status and social support, a Chi-square test was performed at a significance level of 0.05. The results indicated that there was an association between the two ($X^2 = 3.84, p = 0.05$) with 84% of the married patients having social support. The contingency table is represented in Table 5.

Table 5: Contingency table for marital and social support data

			Social Support		Total
Marital Status			**No**	**Yes**	
	No	Observed	43	5	48
		Expected Count	38.5	9.5	48.0
		% within Marriage	89.6%	10.4%	100.0%
		% within Support	33.3%	15.6%	29.8%
		% of Total	26.7%	3.1%	29.8%
	Yes	Count	86	27	113
		Expected Count	90.5	22.5	113.0
		% within Marriage	76.1%	23.9%	100.0%
		% within Support	66.7%	84.4%	70.2%
		% of Total	53.4%	16.8%	70.2%
Total		Count	129	32	161
		Expected Count	129.0	32.0	161.0
		% of Total	80.1%	19.9%	100.0%

Correlation analysis, using Pearson's correlation coefficient (r), was used to measure the degree of association between the independent variables and the dependent variable, LOS. The only significant correlation was age ($r = 0.17$, $p = 0.03$). Table 6 shows the correlation summary.

Table 6: Summary correlation matrix of continuous variables

	LOS	Age	BMI	WOMAC	SF-36 PCS	SF-36 MCS	SMI score	CDS
LOS	1	0.17(*)	0.04	0.03	-0.08	-0.14	-0.08	0.12
Age	0.17(*)	1	-0.38(*)	-0.14	0.01	0.18(*)	0.02	0.33(*)
BMI	0.04	-0.38(*)	1	0.16	-0.16(*)	-0.14	-0.09	-0.06
WOMAC	0.03	-0.14	0.16	1	-0.58(*)	-0.39(*)	0.05	-0.07
SF-36 PCS	-0.08	0.01	-0.16(*)	-0.58(*)	1	0.31(*)	-0.01	-0.10
SF-36 MCS	-0.14	0.18(*)	-0.13	-0.39(*)	0.32(*)	1	0.21(*)	.01
SMI score	-0.08	0.02	-0.09	0.05	-0.01	0.21(*)	1	-0.12
CDS	0.12	0.33(*)	-0.06	-0.07	-.010	0.01	-0.12	1

* Pearson Correlation is significant at the 0.05 level (2-tailed)

Significant interactions between some of the predictive variables were noted. Age and CDS ($r = 0.38$, $p = 0.01$) and age with BMI ($r = -0.38$, $p = 0.01$). As BMI increased, the SF-36 PCS score decreased ($r = -0.16$, $p = 0.05$).

D. Regression Statistics

i) Checking Linear Regression Assumptions

As previously mentioned, LOS was not normally distributed in this sub-study. To draw the appropriate conclusions, the following assumptions underlying linear regression were reviewed:

> (1) there is a linear relationship between x and y; (2) the observations are independent; (3) the residuals are normally distributed with a mean of zero; (4) the residuals have the same variability (constant variance) for all of the fitted values of y; (5) the x variable can be measured without error (Petrie & Sabin, 2005).

The above mentioned assumptions were verified through the following means: (1) linear relationships between each independent variable and LOS were substantiated by inspecting scatter plots of the residuals against each independent variable; (2) the observations were considered independent because there was only one observation for each variable for each individual; (3) visual inspection of the plot of residuals indicated that they were quite normally distributed with residual mean equal zero; (4) residuals were plotted against the predicted values of LOS, and there was no increase or decrease (i.e. no pattern), but a random scatter of points; (5) the x variables (predictors) are rarely measured without any error and this sub-study used measures with as little error as possible.

Lack of normality for LOS post hip or knee arthroplasty has been commonly reported in the literature (Escalante & Beardmore, 1997; Oldmeadow et al., 2002; Weaver et al., 2003) . The previously mentioned studies transformed the data into a symmetric distribution by taking logarithms in order to perform regression analysis. However, verification of assumptions confirmed that a transformation was not indicated for the multiple regression analysis for this sub-study. Therefore untransformed data was used in order to increase interpretability of the results.

ii) Multiple Linear Regression Analysis

Four models were tested using multiple linear regression analysis as an exploratory strategy to investigate possible relationships when inputs were modified in terms of level of significance, number of factors and the effect of the outliers. The initial multiple linear regression model included all variables entered simultaneously. All independent variables collected for this sub-study were believed to be potentially important by the author; hence the full model was tested. The results indicated that the relationship between each of the independent variables and LOS were non-significant (adjusted $R^2 = 0.03, p = 0.17$).

The multiple linear regression was re-run using a backward elimination model with the significance level set at ≤ 0.1. The rationale for choosing this model was to include the full model and then remove unimportant variables one at a time until all those remaining in the model contributed significantly. Altman (1991) recommended a "lax criterion" for the level of significance because variables could contribute to a multiple linear regression model in unforeseen ways due to interrelationships between variables. The three statistically significant predictor variables with the backward elimination were income (p = 0.04), age (p = 0.05) and SF-36 MCS (p = 0.08) with an adjusted R^2 = 0.07 combined. Table 7 summarizes the results from the backward elimination model.

Table 7: Multiple Linear Regression: Backward elimination model to predict acute care length of stay

	Unstandardized Coefficient		Standardized Coefficient	t	Significance	95% CI
Variable	**β**	**Standard Error**	**Beta**			
Constant	**3.80**	**0.53**				
Age	**0.01**	**0.01**	**0.16**	**1.99**	**0.05**	**0.00 - 0.03**
Income	**-0.21**	**0.10**	**-0.17**	**-2.09**	**0.04**	**-0.04 - -0.01**
SF-36 MCS	**-0.02**	**0.01**	**-0.14**	**-1.74**	**0.08**	**-0.05 - 0.00**

Analysis of Variance

Source of variation	Degrees of Freedom	Mean Squares	F	P
Regression	**3**	**2.36**	**4.68**	**0.004**
Residual	**157**	**0.50**		
Total	**160**			

To investigate whether any of the modifiable factors alone influenced LOS, the linear regression analysis was re-run using only the modifiable factors. BMI, social support, WOMAC, SF-36, SMI and home environment were entered simultaneously. The results were not statistically significant.

A final analysis was performed to explore whether the previously mentioned outliers (patients with LOS greater than 6.0 days) were influential on the results of the multiple linear regression. The four outliers were removed from the full model. The results were non-significant with adjusted $R^2 = 0.05$ ($p = 0.10$) and the difference between the standard error of the estimates with outliers and removal of outliers was small, 0.72 and 0.63 respectively.

CHAPTER FIVE

DISCUSSION

The purpose of this sub-study was to determine which modifiable and non-modifiable factors best predict LOS in the acute care hospital setting after TKA and THA when care was standardized. LOS is an important outcome as a marker for resource consumption and thus by studying the predictors of LOS, one can hopefully gain insight into appropriate resource allocation (Collins et al., 1999).

A. Patient Factors

i) Non-modifiable Factors

The average age of patients in this sub-study was 68.9 years old, with patients as young as 44 years of age, being diagnosed with OA and requiring surgical treatment. Nationally, there is an increase in hip and knee arthroplasty surgery for both patients 85 years old and older and for the 45 to 54 age group (Canadian Joint Replacement Registry (CJRR), 2006). Previous research has been controversial regarding age as a predictor of LOS. The present sub-study found a statistically significant correlation between age and LOS and the linear regression analysis using backward elimination was significant as well. Even though the regression analysis was significant, the adjusted multiple correlation coefficient was low, indicating age did not account for much of the variance in LOS.

The sample population in this sub-study demonstrated that more females than males received arthroplasties (67% to 33% respectively). This finding was consistent with the literature and national statistics and is explained by the rationale that females live longer and report increased pain and decreased function with hip and/or knee arthritis (CJRR, 2006; Epps, 2004; Lin & Kaplan, 2004). The results of this sub-study indicated that females' LOS averaged 3.93 days and male patients averaged 3.64 days. This difference was statistically significant ($p = 0.05$). In Alberta, the average LOS in 2005/2006 for both females and males was reported by CJRR (2006) as eight days. When other factors were accounted for (e.g. age, marriage) in the regression analysis, gender was not significant. MacDermid and O'Callaghan (2000) studied risk factors for admission to an inpatient rehabilitation unit post TKA found that gender was not a risk factor, but found that there were more widows than widowers and concluded that the females lived longer and were alone. They questioned if lack of support was a more potent risk factor for admission into a rehabilitation unit than gender. Widow or widowers status can be captured by marital data.

When comparing married with unmarried patients, there was no statistical significance in acute care LOS between the two groups, even though unmarried patients had a longer LOS. The regression analysis indicated that marital status was not a predictor of LOS. This result was in contrast to the findings of past studies that found marital status to be an determinant for rehabilitation LOS or for functional outcome (Lin & Kaplan, 2004; Sharma et al., 1996). The difference in findings could be due to the study populations, both previous studies looked at TKA and also both studies did not look at acute care LOS.

Household income was also found to be a significant predictor using the backward elimination regression model, along with age. Although it was statistically significant ($p = 0.04$), income, along with age and mental status accounted for only a small percentage of the variance seen in LOS (7%). Data revealed that with lower incomes (i.e. < $40,000), LOS increased. Weaver's U.S. study (2003) found the opposite, the higher the income the longer LOS. The differences in results could be attributed to the country in which the study was conducted. Studies in the United States used multi-payer data to determine LOS and insurance companies impose time restrictions on hospital LOS (Lin & Kaplan, 2004). For example if one was wealthier, one probably could have extra insurance coverage and thus the hospital stay is covered for a longer post-operative period. In Canada private insurance is not a factor.

ii) Modifiable Factors

The results of this sub-study indicated that patients who had home support (i.e. receive care by others – family member, home care, or reside in assisted living environment) had a LOS of 4.06 versus those receiving no support (3.78 days). Although there was a difference in LOS between the two groups, it was not statistically significant. It was presumed, by the present author, that social support would be a factor in determining acute care LOS, versus marital status or gender. It was a surprise to see that LOS was longer for those receiving support. It was presumed that if one had support prior to hospitalization versus no support, one could be discharged earlier. The rationale for the delayed discharge for patients with support could be that these patients may have processed physiological and/or psychosocial issues pre-operatively (i.e. frail patients) and consequently the need for extended LOS related to these issues. Another theory is that they are use to depending on others pre-operatively and once hospitalized TJA patients are expected to work towards independence prior to discharge. The findings from this sub-study are not consistent with the other studies. Munin et al. (1995) found that fifty-one percent of arthroplasty patients discharged to a rehabilitation unit lived alone. Lack of social support was found to be associated with requiring inpatient rehabilitation in total knee patients (MacDermid & O'Callaghan, 2000). The difference in results could be due to the operational definitions of social support used in previous studies (i.e. no social support meant that they lived alone), whereas in this sub-study one could live alone, but still have social support (e.g. homecare, family assistance). For example five patients in the sub-study lived alone (e.g. not married) and had some form of social support.

It was hypothesized that marital status would not necessarily indicate that one has support at home nor does the label widow/widower indicate that one has no support system. The sub-study results found the opposite, married patients (84%) had social support and there was an association between home support and marital status with $X^2 = 3.84$ ($p = 0.05$).

Home environment data such as the location of the bedroom and the number of steps to enter the home was analyzed. This sub-study found that home environment was not a predictor of LOS. Munin et al. (1995) found home environment was not a predictor of the patients discharge location, such as home or an inpatient rehabilitation facility. An explanation for this could be that patients who had been managing in their environment with a disability prior to elective surgery were likely to do so afterwards (Oldmeadow, McBurney, and Robertson, 2003). Another explanation could be that the younger patient or patients with support at home, seemed to be able to negotiate their home setting post-operatively (Munin et al., 1995). In this sub-study, having support at home and the fact that there were younger patients could have explained why home environment was a non-predictor of LOS.

An issue in past studies is the lack of research done on motivation with this patient population, especially as a predictor of LOS. The SMI short version was used to measure patient motivation. This sub-study found it to be statistically non-significant, but one should look at the clinical implications of motivation. Self-motivation is an important trait to account for in research because it may moderate how a patient reacts to exercise demands (Annesi, 2002). Rehabilitation in the acute care stay for TJA is very intense and it includes activities such as ambulation, lower extremity exercises, transfers, and stairs. These are key goals that a patient has to achieve in order to be discharged. To achieve independence with these activities, patients must endure induced discomfort/pain. Motivation or the innate ability to persevere, even through pain, is an important personal trait. The base line SMI scores for this sub-study population were considered high. Due to long wait times, patients with OA live with pain in their hips and/or knees for months prior to having surgery (Martin et al., 2000). The combination of waiting and dealing with pain could attribute to the high motivation level in this sub-study sample. Annesi (2002) states that those with high self-motivation scores interpret feelings such as physical exhaustion and fatigue to be similar to being productive and those with low self-motivation respond with aversion for discomfort.

Pre-operative mental status was analyzed using the SF-36 MCS. The SF-36 was not correlated with LOS, but was a predictive factor, along with age and income in the backwards elimination regression analysis. This indicates that the MCS score does add some prediction even when the variance related to age and income is removed.

B.Clinical Factors

i) Non- Modifiable Factors

The findings from this sub-study indicate that cormorbidity was not a predictor of acute care LOS using the Chronic Disease Score (CDS). Past studies have reported comorbidity diagnosis and either analyzed the number of comorbidites or types of comorbidities with LOS and conclusions have been mixed. There is confidence in the findings from this sub-study, since the CDS was a single aggregate measure that provided reliable data and could be used statistically (McGregor et al., 2005). Past methods relied on the accuracy of the recorded diagnosis and there was no weighting to determine the severity of each diagnosis. This sub-study also found a correlation between age and CDS, older subjects had higher scores on the CDS. This finding was consistent with research done by MacKnight and Rockwood (2001) who hypothesized that most older adults have multiple chronic diseases and found that the CDS estimated comorbidity in older adults.

ii) Modifiable Factors

Obesity is one of the known factors associated with OA (CJRR, 2006). Since OA is a primary reason for TJA, it was of interest to examine BMI. BMI was not a determinant for LOS in this sub-study as was found with previous research (Forrest et al., 1998; Kwoh et al., 1993; Lin & Kaplan, 2004). This sub-study did find a correlation between BMI and the SF-36 PCS scale. As BMI increased, the physical component score decreased, indicating that patient's general physical health status was poorer prior to surgery.

Patient baseline health status in terms of physical function was measured by the WOMAC and SF-36 PCS. Neither of these were identified as a determinant of LOS. There were no past studies in relation to LOS to compare this data to. All other studies have looked specifically at health status as a predictor of post-operative recovery or outcome (Jones et al., 2003; Young et al., 1998). It is standard practice to optimize physical function and strength pre-operatively

(Jones et al., 2003) and this has been proven to lead to positive outcomes, but this does not seem to be a factor in decreasing LOS.

B. Treatment Factors

The scope of this sub-study did not include treatment factors (e.g. intra-operative and post-operative effects). Epps (2004) found treatment factors were difficult to measure and were determined by many things such as surgical skills, intellectual and interpersonal skills and treatment processes. It was noted that the four outliers with regards to LOS were due to post-operative complications which included congestive heart failure, urinary retention, irregular heart beat and a small trochanter fracture. Forrest et al. (1998) would consider these as medical and local complications and are usually reported to be less than five percent. These accounted for 2.5% of the total patient population in this sub-study.

C. Study Strengths

The following sub-study strengths attempted to address the limitations that were acknowledged in previous research:

1) The majority of studies were retrospective and relied on recorded data that was not validated or verified. This sub-study used prospectively collected data that enabled the collection of relevant and complete data sets. There was no exclusion of patients due to missing data, which avoided selection bias.

2) The questionnaires were selected by a provincial health care professional panel that included the author to ensure important data elements were captured. Obtaining this data provided the ability to incorporate many factors into the regression model, such as modifiable psychosocial (e.g. motivation, home environment, and social support) factors. Previous retrospective studies were limited to only those factors present on patient records.

3) Operational definitions were clearly outlined prior to the commencement of the larger study, which enabled the collection of appropriate data. For example, marital status was collected along with social support/living arrangements.

4) The incidence of OA in younger patients is increasing, especially in the 45 – 54 year old range (CJRR, 2006). This study captured the data for those patients and demonstrated this trend. Previous studies have excluded younger patients on the assumptions that they have decreased comorbidities, decreased healing time and increased mobility. In order to generalize findings, it was important to include this growing population.

5) This sub-study investigated the potential of both non-modifiable and modifiable factors. Past studies have focused on non-modifiable and less on the modifiable psychosocial factors. Most studies investigating these factors looked only at outcome post discharge from hospital versus LOS as the outcome variable.

6) Past research had analyzed predictors of LOS without controlling for confounding variables, such as physician practice patterns, discharge criteria, pain control methodologies and rehabilitation protocols, which could influence LOS. This sub-study used an evidence-based, standardized arthroplasty care model which ensured that the above confounding variables were controlled. This standardization provided the opportunity to measure non-modifiable and modifiable variables that may have had an impact on LOS without including extraneous factors. For example, a clear discharge criterion, such as independent/safe with walking aid and follows hip precautions, along with evidence-based directives for post-operative pain management. There was no knowledge of these being reported in previous investigations.

7) Comorbidity data was collected using the CDS. Past studies have looked at the total count of comorbidities which weights each comorbidity equally. The CDS used medications weighted to correspond to various disease complexities and severities.

D. Study Limitations

The conclusions drawn form this sub-study were limited by the following:

1) The sample was obtained from one facility in one city which could affect generalizability to a larger population who undergo TJA. However, the sample chosen appears to resemble the CJRR data fairly closely. Also the patients were under the care of eight different surgeons.
2) Hip and knee arthroplasty data was analyzed as a single group. Even though there was no statistical difference in LOS between the two groups, an argument could be made that the two surgeries are not the same in terms of procedure and post-operative care, and thus the findings may not be generalizable to either group alone. The evidence-based standardized care plan dictated surgical preparation, procedure and post-operative care for both hips and knees which controlled for any variation. Gregor et al. (1996) demonstrated that a clinical care plan for both THA and TKA can be used because there are many common decision points for both groups.
3) Only OA patients were included in this sub-study sample, therefore conclusions regarding other diagnostic groups (e.g. RA) can not be made.
4) Access to the larger study provincial findings was not available at the time of this thesis publication. The comparison of findings between the larger study and this sub-study would have been useful in order to compare sub-study findings with data from the other two health regions in Alberta (Capital and Thompson).

5) The evidence-based standardized care arthroplasty model was noted as a strength, but could also be seen as a limitation for this sub-study. With TJA patient care standardized across the continuum from initial orthopaedic visit to post-operative recovery, acute care LOS was decreased significantly compared to provincial statistics for hip and knee replacements (eight days). The impact of lack of variance from the rigid care plan removed variability in the acute care LOS. It is almost impossible to find predictors because the care model ensures discharge deadlines. Patient care is complex and variable, but by administering an evidence-based care plan, variability was contained and resulted in a significant decrease in LOS.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

A. Summary

Hip and knee surgery has increased by 52% and 125%, respectively in the last 10 years (CJRR, 2006). Arthroplasty surgery has been shown to provide excellent outcomes for most patients, with a decrease in pain and an increase in quality of life and function (Fortin et al., 1999; Jones et al., 2003). High volumes, long wait times and rising health care expenditures have created pressure for health organizations and institutions to decrease hospital LOS for TJA's.

Factors have been identified as predictors of outcome after hip and/or knee arthroplasty surgery. However, little research has been done to look at predictors of acute care LOS, especially modifiable factors. Many of the predictive factors identified in past studies would be considered non-modifiable (e.g. age, gender and income). Modifiable factors such as home environment and social support have been postulated to be predictors in terms of discharge to a rehabilitation unit (Lin & Kaplan, 2004; Sharma et al., 1996) This sub-study looked at both the non-modifiable and modifiable factors (i.e. physiological and psychosocial) and their influence on acute care LOS when care was standardized. Many variables that might have been expected to be predictors of acute care LOS were not seen to be significant in this sub-study. These results could be attributed to the minimal variation in care processes which lead to the significant decrease in LOS for this sub-study population. Results from the multiple linear regression analysis using backward elimination found age, income and SF -36 MCS to be the only statistically significant factors. Despite the significance, age,income and SF-36 MCS only accounted for a small amount of the variability in LOS.

This sub-study identified a substantial decrease in LOS when compared to national data on Alberta's LOS. These patients received coordinated care throughout the care continuum, including the initial assessment, pre-operative care, acute care and recovery stages by trained professional staff. These initiatives controlled for practice variation which was not explored in past studies. Decreasing a patient's stay by even a few hours can have an effect on TJA wait times and health care expenditures.

B. Clinical Significance

The findings from this sub-study indicated that age, household income and mental status were statistically significant predictors of acute care LOS. Age and income cannot be changed; however, knowledge of their effects can help plan patient services. For example, with increased age, there was an increase in LOS. Specific strategies to deal with this factor include adjusting the OR case mix, one could assign various aged patients to the daily OR slate so that not all elderly patients have surgery on the same day. This would permit inpatient resources to be allocated appropriately, supporting earlier discharges for these patients. Also, older patients should be evaluated more extensively prior to surgery in order to identify their needs. In terms of household income, patients who have lower incomes could be provided with appropriate resources pre-operatively, such as affordable aids and equipment, in order to enhance discharge planning and thus decrease LOS. To address mental status, one could identify those patients's with lower SF-36 MCS scores pre-operatively and focus on their affect, psychological and emotional needs.

Many factors that were thought to be predictors of LOS did not seem to be important statistically in this sub-study such as motivation, home environment, BMI, physical function and social support. These factors should still be evaluated prior to surgery and addressed appropriately in order to assist patients pre-operatively while they wait for their TJA and post-operatively to promote independent living.

C. Suggestions for Future Research

Standardized clinical paths or models of care define the processes of care that lead to the best patient outcomes. Previous work has indicated that clinical paths and practice guidelines lead to decreased LOS (Epps, 2004; Messer, 1998). Identification of non-modifiable and modifiable factors that influence acute care LOS will assist in formulating and changing existent clinical care paths. In order to clarify and strengthen past and present findings, the following research should be done:

1) Analyze data from the Alberta Arthroplasty Study control group to test assumptions that modifiable and non-modifiable factors play key roles as predictors of LOS. The control group did not receive the

standardized arthroplasty care model (i.e. pain management, rehabilitation protocols, strict discharge criteria enforcement).

2) Investigate, in more detail, modifiable psychosocial factors (e.g. motivation, anxiety, spirituality, patient/family expectations, patient compliance and willingness for surgery) as predictors of acute care LOS. Sharma et al. (1996) did find that psychosocial factors played a role in functional outcome post TJA. Hawker et al. (2006) found that willingness for surgery was a strong predictor of time to TJA. Could willingness for surgery, anxiety, depression be predictors of LOS?
3) Further research is needed to quantify the results of TJA among different care settings along the continuum. With the decrease in LOS in the acute care setting, there has been reallocation of resources both pre-operatively and post-operatively. Assessment of the total care continuum would allow researchers to capture where the predictive factors need to be addressed – pre or post-operatively. For instance, age is not modifiable, but addressing the OR case mix and post-operative resources are. Also, there is minimal research that looks at how reallocation of resources would impact patients, their care givers and the provision of health services outside the acute care model, in terms of financial and resource burden.

D. Conclusions

This sub-study attempted to identify modifiable and non-modifiable factors that best predict LOS in the acute care hospital setting after TKA and THA surgery when care was standardized. Statistically, age, income and SF-36 MCS were found to be predictors of LOS, which was identified in previous studies (Escalante & Beardmore, 1997; Rissanen & Seppo, 1996; Weaver et al., 2003). Results must be interpreted with caution and the findings must be viewed in the context of other TJA programs that may represent differences in clinical pathways, availability of resources, and skill levels of providers. Clinically, patient-centered care is topmost, so it is crucial to assess patients prior to surgery and identify patient and clinical factors so that they can be addressed appropriately.

It is important to take from this sub-study that when care was standardized and based on available best-evidence, both non-modifiable and modifiable factors had minimal influence on LOS. Physiological and psychosocial factors are addressed by the standardized care model to improve quality of patient care which leads to improved efficiency in care and decreased LOS. Previous research has identified significant predictive factors for LOS but care was not evidence-based and standardized.

It is crucial to continue to collect information to be used to predict service needs for patients requiring TKA and THA. It is also vital that standardized care plans are adjusted based on future studies of predictive factors; to meet the needs of patients at any stage of the continuum and that they are adhered to regardless of patient unit or hospital site. All of this will lead to patient centered care; decrease LOS in acute care and appropriate resource allocation/consumption in the prepatory, acute and post-operative phases of TJA care.

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APPENDIX A

The Alberta Arthroplasty Study

ALBERTA
BONE & JOINT HEALTH
INSTITUTE

THE ALBERTA ARTHROPLASTY STUDY

A RANDOMIZED CONTROLLED PROSPECTIVE STUDY TO EXAMINE THE EFFECTIVENESS OF A NEW EVIDENCE BASED ARTHROPLASTY CARE MODEL FOR PATIENTS WITH SEVERE DEGENERATIVE JOINT DISEASE (DJD) OF THE HIP OR KNEE IN ALBERTA

UNIVERSITY OF CALGARY
FACULTY OF MEDICINE

College of Physicians & Surgeons of Alberta

FOUNDATION PROPOSAL: 12 MARCH 2005

PURPOSE

To determine if a New Arthroplasty Care Model, established on evidence-based medicine and best practices, improves patient outcomes and improves cost effectiveness for patients with severe degenerative joint disease (DJD) of the hip or knee in Alberta.

BACKGROUND AND RATIONALE

Degenerative joint disease (DJD) affects over ten percent of the Alberta population (1), and osteoarthritis (OA) and rheumatoid arthritis (RA) represent the most common causes of DJD. Seventy percent of patients over the age of 70 have been identified as having radiographic evidence of OA. During the course of their suffering many patients will try alternative medications and therapies as they struggle to find relief of their symptoms. The alleviation of symptoms related to pain, stiffness, and loss of function demands substantial resources at all levels of the health care system. Hip and knee replacements (arthroplasty) have been recognized as one of the most effective surgical interventions in the management of this condition.

The current conventional approach to hip and knee arthroplasty typically reflects that of the individual surgeon, the hospital they operate in, and the health authority(s) in which the patient receives care. The operative component as performed by the surgeon is broadly standardized with the exception of the implant used. The balance of the continuum of care, pre and post the operative component, can vary widely with respect to the process itself and the standards (volumes, access, waits, quality, resource use, etc) to which the process is performed.
Gaps and barriers to care include but are not limited to the following:

Overall:

- Care and interventions across the continuum of care are not well integrated and standardized for an evidence based perspective.

Access to a Referring Provider:

- Access to a primary care physician can be limited
- Referrals from non physicians may not be accepted
- Patients seek and receive a variety of treatments from a range of providers some of which may be appropriate some which is not

Referring Provider to an Orthopedic Surgeon:

- Delays in access due to the number of new patients orthopaedic surgeons are taking (linked to operating room and bed restrictions)
- Patient condition deteriorates due to delays in access
- Patients seek and receive a variety of treatments from a range of providers some of which may be appropriate some which is not
- Referral information provided is highly variable resulting incomplete screening, poor patient prioritization and the referral of inappropriate patients
- Referred patients who do not require surgery but who require an alternative approach to treatment are not always well served

Orthopedic Surgeon to Hospital:

- Delays in access due to a lack of operating room resources and beds
- Patient condition deteriorates due to delays in access
- Patients seek and receive a variety of treatments from a range of providers some of which may be appropriate some which is not
- Variability in preoperative assessment and preparation resulting in further delays, day of procedure cancellations, extended recovery times, discharge delays (home not ready), etc.
- Inability to expedite care for those most in need without bumping other patients

Hospital to Discharge from Hospital:

- Variability in approach to inpatient care resulting in outcome variability
- Long inpatient lengths of stay due to a range of factors
- Delays in discharge due to a range of factors

Hospital Discharge to Recovery:

- Variability in approach to post hospital care resulting in outcome variability
- Delays or a lack access to all the appropriate providers (home care) resulting in delays in recovery or compromised recovery
- Patients seek and receive a variety of treatments from a range of providers some of which may be appropriate some which is not

Recovery to Ongoing Monitoring:

- Variability in approach and frequency and may result in more complicated revisions

Between April 2002 and March 2003, 1786 total hip arthroplasty procedures and 2380 total knee arthroplasty procedures were performed in Alberta (data from Alberta Health and Wellness). On an annual basis in the United States, where qualified access to operative and bed resources are not restricted, 1.03/1000 total hip and 1.16/1000 total knees are performed. This per 1000 utilization rate would equate to 3193 total hip and 3596 total knee procedure per year in Alberta. These volume estimates suggest that access for Albertans to these procedures is overly rationed. This rationing is in fact reflected in the long waits for access in Alberta – reports as long as 80 weeks from referral to surgery and it is these long waits that create the majority of the gaps and barriers and the negative consequences from these gaps and barriers.

The Alberta Orthopaedic Society through its Arthroplasty Service Design Working Group has, after carefully reviewing the existing conventional approach to arthroplasty care, developed what they believe could be a much improved new evidence based arthroplasty care model. This model represents how ideally a patient would access and receive health services across the complete continuum of care. In addition, wherever possible, evidence gathered from the literature and from "known best practices" has been utilized to develop standards related to access, wait times, clinical quality, resource use and health outcome measures. Where no evidence or "known best practices" exist, a standard that best support achieving other known standards are being developed. This new evidence based arthroplasty model seeks to significantly minimize and where possible, eliminate all the current gaps and barriers to arthroplasty care.

This study will seek to prove that the new evidence based arthroplasty model will deliver improved patient outcomes with improved cost effectiveness. Once proven, it is anticipated that this new evidence based arthroplasty model will become the standard of care in Alberta, and a model for other jurisdictions to use in their health service re-designs.

OBJECTIVES

1. To compare patient outcomes including quality of life and adverse events
2. To compare activity based costs
3. To compare cost-effectiveness
4. To assess patient satisfaction
5. To assess health care provider satisfaction

TARGET GROUP

For the purposes of our study, severe degenerative joint disease constitutes a patient who suffers from osteoarthritis in a specified joint and who is under evaluation by a specialist for a surgical intervention. The study will recruit and randomize approximately 4,800 patients to receive the current standard of care or care from the New Arthroplasty Care Model. The sites for the New Model will take place in Edmonton, Calgary and Red Deer in clinics separated from the existing care facilities.

METHODOLOGY

Physician Recruitment

13 Orthopedic Surgeons that perform the highest amount of arthroplasty procedures in Alberta have agreed to participate in the study. Each physician will agree to adhere to the protocol procedures..

Preparation of Randomization Tables

In general, the number of strata used for randomization should be kept to a minimum to avoid sparseness within each stratum. Other strata identified as important prior to or following the completion of a trial can be subsequently accounted for in statistical analysis with little or no loss of statistical power. Important strata to be accounted for in this trial include regional health authority, hip versus knee patients and patient group. There are three types of patient groups: Group 1 = patients who have been seen by a specialist and who are waiting for surgery, Group 2 = patients who have been referred but who do not yet have a date for seeing a surgeon, and Group 3 = new patient referrals (within past 14 days). Stratifying by these patient groups is important, as all patients in group 1) will receive surgery, but it is estimated that as little as 50% of patients in groups 2) and 3) will require surgery. We will stratify the randomization by surgeon, site of joint condition (hip or knee), and patient group. As there are 13 surgeons participating in the project, this will require 78 randomization lists.

Arthroplasty Distributions

1200 surgeries within the new model have been committed to by the healthcare 'payers' (Alberta Health and Wellness, and the participating Regional Health Authorities). This includes 500 surgeries in the new model for both the Calgary Health Region and the Capital Health Authority, and 200 surgeries in the new model for the David Thompson Health Authority Center. Each of the regional health authorities have determined the distribution of "new" surgeries for each of the patient groups (table 1).

Health Region	Percent Group 1	Percent Group 2	Percent Group 3
Capital	40	11	49
Calgary	40	30	30
David Thompson	15	12	73

Group 1 = patients waiting for surgery; Group 2 = patients waiting for consult date; Group 3 = new referrals

Table 1. Percentage of joint replacements for each patient group in the new arthroplasty model

Clinic Inventories

Office staff from within the participating physician offices will be required to submit a dataset of the patients waiting for surgery or waiting for a first consult. The offices will be supplied with an excel spreadsheet that will require the following information: Patient last name; patient first name; DOB; gender; patient address; patient phone number; patient group (waiting for surgical date or waiting for first consult); Alberta healthcare number; referral date; referred by (GP; other orthopedic surgeon; rheumatologist; other specialist; unknown); first consult date (if applicable); has surgical date (yes/no); is a revision (yes/no); is requesting hip resurfacing (yes/no).

These data sets will be sent directly to the Alberta Bone and Joint Health Institute (ABJHI) who are affiliates for the participating surgeons (custodians). Offices may request the use of staff within the ABJHI to assist with the patient inventory process.

Patient Selection (Groups 1 and 2)

From each of the physician lists the appropriate number of patients (table 2) will be "randomly" selected from the dataset using a statistics software application.

Health Region	Percent Group 1 (n)	Percent Group 2 (n)	Percent Group 3 (n)
Capital (5 physicians)	80	22	98
Calgary (6 physicians, 5 Surgeon Slots)	80	60	60
David Thompson (2 physicians)	30	24	146

Group 1 = patients waiting for surgery; Group 2 = patients waiting for consult date; Group 3 = new referrals

Table 2. Number of patients per physician, selected for recruitment in both the new and old arthroplasty model

For example for a surgeon participating in the Calgary Health Region, 80 patients (40 per study arm) waiting for a surgical date and 60 patients (30 per study arm) waiting for a consult date will be selected from the physicians dataset.

Patient Selection (Group 3)

"New Referrals as defined in group 3 are considered to be referrals that occur after the inventory process. An automatic data retrieval process will be put in place for offices to automatically notify the ABJHI of new referrals to the participating physician. Recruitment of this group of patients must be staggered for each month of the project. Selection of new referrals will occur bi-weekly and be defined as a referral to the physician within the past 14 days. Initially, the surgical yield will be assumed as being 100% to ensure that the project does not incur more than 1200 consented surgeries in the new model. Data regarding surgical cases in group 3 will be provided to ABJHI from the electronic medical record within the new model. This information will contribute to the monthly reports which will be generated for ABJHI to adjust the numbers of patients generated from the patient lists. For example, over the 12 months of the project, a participating surgeon in Calgary will be required to recruit 5 (8.3%) surgical cases per month from group 3. If by the end of month 3 this surgeon has only 6 surgical cases within this group, the patient selection will increase to 6 per month. Likewise if a practice closes for a defined period of time, whereby there are no new referrals, the patient selection numbers will increase accordingly for the remaining months.

Patient Consent and Recruitment

A recruitment package will be mailed to each of the patients selected. This package will contain a cover letter signed by the patient's orthopedic surgeon, a consent form, the baseline patient questionnaires and a prepaid return envelope. The cover letter and patient consent will describe the purposes of the New Arthroplasty Model and its evaluation, and will indicate that if the patient agrees to participate in the study, that he or she will have a 50% chance of receiving treatment from within the New Model. Patients who agree to participate in the study will be instructed to sign the consent form, complete the questionnaires and then return this information to the ABJHI in a prepaid self-addressed envelope.

Patients that do not return a consent form will be contacted to ensure that the packages were not misplaced. For patients in group 1 and 2 only, additional lists of patients from the physician datasets will be generated to match the percentage of patients declining consent.

Patient Screening

Information from the clinic inventories and the baseline data collection forms will provide the ABJHI with the appropriate information to screen patients before randomization. The inclusion / exclusion criterion includes:

Inclusion:

- Patient is at least 18 years of age
- Patient is able to provide written consent

Exclusion:

- Patient has previously undergone arthroplasty of the same hip or knee (revision)
- Patient has a surgical date scheduled for arthroplasty
- Patient is waiting for a hip resurfacing procedure or an oxford knee
- Patient has a concurrent medical condition that would contraindicate the patients' ability to participate fully in the study procedures, including terminal conditions such as chronic obstructive pulmonary disease, end stage renal disease, heart failure, malignancy with an anticipated life expectancy of ≤ 2 years
- Patient has senile dementia or Alzheimer's disease

Patient Randomization

The research coordinator at the ABJHI will have access to the randomization tables. When he receives a package from a patient, he will first determine whether the patient is eligible for the trial, and then will identify the stratum to which the patient belongs. He will then consult the appropriate randomization list to determine the treatment group assignment and define the patients study identification number. If the patient is assigned to the New Arthroplasty Care Model, relevant patient information will be sent to the referral clinic manager within the new care models in Calgary, Red Deer or Edmonton. The referral center will then contact the patient and arrange for enrollment in the New Arthroplasty Care Model. The research coordinator at the ABJHI will also send a card to the patient's orthopedic surgeon indicating that the patient has been assigned to the New Arthroplasty Care Model, and that follow-up consults will occur outside of the physician's clinic until further notice.

New Model Clinics

Patients randomized to the Arthroplasty Care Model will undergo evaluations and clinic visits within a New Model Center in Calgary, Red Deer or Edmonton. Each New Model Center will be comprised of infrastructure including an Arthroplasty team that will follow the treatment management procedures and guidelines as they are illustrated in the Arthroplasty Care Map. The team will include the project leaders, administrative support, physiotherapists, dieticians, medical assistants, nurses and orthopaedic surgeons. Although the control group will not participate in the new arthroplasty care model they will be required participate in data collection via interactions with the ABJHI. The control group will have no contact with the new model centers or providers working in the new arthroplasty care model, other than the orthopedic surgeon to which they were referred.

Data Collection

Data will be collected at baseline and at specified monthly intervals. The following lists summarize the data elements that will be collected prospectively from various sources.

Patient Questionnaires:

- Patient id number
- date of birth
- height
- weight
- ethnicity
- onset of joint disease
- quality of life (SF-36)
- indirect costs including lost work hours
- socioeconomic data
- employment history
- co-morbidities
- medication use
- alternative care and therapy utilization
- Physical activity assessment (Framingham Physical Activity Questionnaire)
- Quality-adjusted life years (HUI3)
- Osteoarthritis Index (WOMAC)
- Patient satisfaction

Orthopedic clinic charts:

- date of referral (T0)
- date of first orthopedic consult for specific joint (T1)
- surgeons diagnosis
- diagnostics tests and results (x-rays; MRI; RSA etc)
- date of decision for surgery (T2)
- surgeons treatments and recommendations
- pain management
- signs and symptoms
- adverse events (post surgery)

Pre-operative care:

- physiotherapy treatments
- consultations by other healthcare providers, eg dieticians

Surgery details:

- hospital
- surgeon
- date of surgery (T3)
- time to complete surgery (start; stop)
- joint site replaced
- surgical approach
- DVT prophylaxis
- Antibiotics administered
- Anaesthetic used
- Device implanted (type; manufacturer; lot number)
- Peri-operative complications
- Surgical notes

Hospital Information:

- hospital number
- regional health authority
- date of admission
- date of discharge
- medications administered
- type and frequencies of post-operative care
- specific discharge information

Administrative data:

- visits to general practitioners
- visits to orthopedic surgeons
- visits to other specialists
- visits to other health care providers
- hospitalization information
- ER and outpatient visits
- Prescription medication information (patients > 65 years only)
- Procedure codes
- Diagnostic codes

Other:

- Health care provider satisfaction questionnaires

DATA ANALYSIS

Data will be analyzed with an intent-to-treat approach.

Boxplots will be used to examine the distribution of the health related quality of life scores within each group at each data collection interval. If the distributions are symmetrical and approximately normal, we will summarize the difference in treatment means using 95% confidence intervals. If the lower tail of the confidence interval around the treatment mean minus the control mean is greater than zero, this will constitute evidence that the outcomes for the evidence based intervention are superior to usual care.

To ensure that there are no baseline differences between the groups, we will use descriptive measures to compare the groups with respect to demographic and clinical variables. We will use an analysis of covariance models to adjust for any imbalance between the groups.

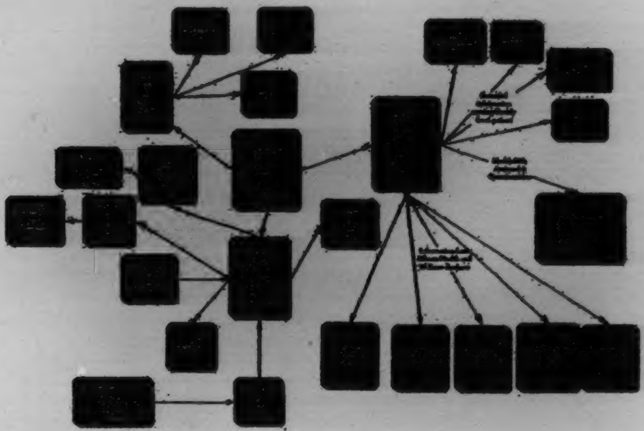
Patient utility will be summarized utilities and 95% confidence intervals will be calculated for the difference in treatment means as described for the patient outcomes. Poisson distribution will be used to compare the groups with respect to health care utilization such as physician visits, chiropractor visits, and surgery rates, adjusting for baseline imbalances in patient characteristics if necessary. Drug utilization will by summarized by drug type, and we will construct tables showing drug utilization by treatment group. We will calculate the costs for each patient, and will use this in conjunction with the health related quality of life and utility scores to determine the cost effectiveness for the evidence based intervention. We will use an alpha level of 5% for all tests of significance.

The process and types of analyses performed will be under the direction of the Project Advisory and Expert Committee. Experts in biostatistics and health economics will be consulted to assist with the analyses strategies and methods as required.

DATABASE MANAGEMENT

Database Management

For security and proficiency reasons, a separate server within the ABJHI will be used to house all data captured for the study. Data will be linked as illustrated below.



Quality Assurance and Data Validation Methods

Quality assurance measures will be modeled and implemented to ensure the data is as collected and analyzed as accurately as possible. The database will include programming to generate reports that identify missing variables or specific out-of-range data. All data collected from the patient charts, hospital medical records and patient interviews will double keyed and validated.

PATIENT CONFIDENTIALITY

The appropriate steps, measures and procedures will be undertaken to ensure that patient and physician confidentiality is maintained. Each patient and participating physician will be assigned a non-identifiable study identification number prior to participation in the study. Only aggregate data will be generated and used for reporting and publications.

Standard operating procedures (SOPs) will be documented and enforced to limit access to the research database and to reduce risk of breeching patient and physician privacy. Only the data manager, IT administrator and the data analyst will have complete access to the individual data elements within the database tables. Data entry personnel will have access to data entry screens only and all study personnel will have signed confidentiality agreements prior to the initiation of the study. All data requests will be reviewed and pre-approved by the Project Advisory Committee.

PROJECT EXPERT AND ADVISIORY COMMITTEE

A Project Advisory Committee will be appointed to bring the appropriate experience and expertise to the study. The role of the Project Advisory Committee will be to develop and approve the research proposal and to monitor the study progress. Interim reports may require amendments to the proposal which will remain the responsibility of the Project Expert and Advisory Committee. This committee will also be responsible for reviewing and approving requests for specific data analysis. The study experts will be lead by Dr. Jack Williams who will identify and appoint other national experts to this committee.

PROJECT MANAGEMENT COMMITTEE

A Project Management Committee will be appointed by the Project Advisory Committee and will meet regularly to ensure the project is on target to meet timelines and deliverables as outlined by the project protocol. The Project Management Committee will also be responsible for ensuring expenditures are appropriate and will provide updated project and financial reports to the Project Advisory Committee.

DATA CLINICAL AND SAFETY COMMITTEE

A Data Safety Committee and a Data Clinical Committee will be established to review interim safety reports. These committees will independently review all major adverse events as well as review evidence from interim analysis reports. The Data Clinical Committee will additionally evaluate evidence at pre-specified time points, and also if certain criteria are not met e.g. excessive post-surgery complications.

ETHICS

Ethic approval letters for this study have been received from the University of Calgary Conjoint Ethics Board, the University of Alberta Ethics Board and the College of Physicians and Surgeons of Alberta. The Principal Investigators for this study are Dr. Cy Frank (University of Calgary), Dr. Tim Pearce (College of Physicians and Surgeons of Alberta) and Dr. Bill Johnson (University of Alberta).

RESEARCH SPECIFIC BUDGET (YEAR 1)

[redacted]	[redacted]
Total	713,500

APPENDIX B

Arthroplasty Care Model

Hip and Knee Replacement Project
Clinical Path
June 9, 2005

This clinical path is a standardized guideline based on best available evidence. Variance from this clinical path will occur when patient's need dictates at discretion of the Orthopaedic Surgeon and other Physicians. All variances from this clinical path are to be documented.

Patient Inclusion and Exclusion Criteria:

- All patients who may be in need of a primary hip or knee replacement.
- Patient who may require a primary hip or knee replacement in the future, and need specialist assessing and treating.
- Patients who require hardware removals or who require additional surgical procedure related to but in addition to a primary hip or knee replacement are excluded.
- Patients requiring an UKA are excluded.
- Patient requiring a Birmingham Hip are excluded.
- Patient requiring a simultaneous bilateral joint replacement are excluded; however, patients who are to receive bilateral joint at two separate encounters are included (must be discharged and recovered prior to second joint replacement).
- Adolescents under the age of 17 are excluded.

Arthroplasty Primary Hip & Knee Path – Referral To Medical/Surgical Optimization

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
Assessment/ Monitoring	❖ Referring physician completes standardized referral template	❖ **Pre-Arrival** Womac, SF 36, Health Utilities Index, Framingham completed on enrollment ❖ **During Evaluation** Harris Hip, Knee Society, WCWL Priority Wait Score social, function, medical: Physical Function Outcome measure (to screen for patients requiring outpatient physio to prepare for surgery) ❖ **Discharge Planning** Questionnaire (OT) – identifies potential discharge issues with patients.	❖ GP/Medical Management Team ongoing monitoring of all patients ❖ Identify any changes in medical status and advise Arthroplasty Team/Clinic ❖ Patient specific based on contract and medical threshold criteria ❖ Ongoing two way communication re. shared care responsibilities with Arthroplasty Clinic	❖ Arthroplasty Team ongoing monitoring and coaching of all patients ❖ Patient specific based on contract and functional threshold criteria Medical Functional Social ❖ Patient contract "go" checklist.
Consults	❖ Internal medicine and/or Cardiology and/or GP managed patient consult required for all patients with: Insulin dependent diabetes, Ischemic heart	❖ Anaesthesia review of surgical patient files re. surgical appropriateness and need for hands-on consults ❖ Criteria for home OT consult:	❖ Refer patients to appropriate services to resolve discharge issues (e.g. Home Care/Private Home Makers) ❖ GP/Medical Management Team	❖ Anesthesia consult for patient identified from chart review. First visit assessment ❖ Criteria for PT consults: • Frail elderly or debilitated • Multiple joint involvement limiting function preoperatively

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
	disease, restrictive lung disease, anticoagulated for any reason, uncontrolled hypertension Anemia, Morbid Obesity, BMI >40 ❖ Cardiac disease CHF Current management by internist or cardiologist ASA3 or greater	• Patient will live alone post-op with little to no support • Patient caring for spouse or dependent • Patient having difficulty with self care or independent functioning • Patient requiring extra (more permanent) equipment in home • Patient with multi-levels in home • Patient requiring multiple community resources to assure independence post-op • Cognitively challenged ❖ GP/patient consult if preferred surgeon not available within wait standards ❖ Dental consults for	initiated as required ❖ Medical conditions, Weight control, Smoking cessation encouraged	• Patient with decreased balance & poor ambulation pre-op • De-conditioned patient with weak upper body strength • De-conditioned patient with poor cardiovascular fitness & minimal exercise tolerance pre-op • Patients with significant contractures or quad lag pre-op • OT for patients with potential discharge issues.

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
		patients preoperatively at discretion of Arthroplasty Team (within 3 months)		
Tests/ Diagnostics	❖ **Imaging Knee**: AP weight bearing; lateral of knee with knee flexed at 90 degrees; skyline Hip: AP pelvis centered at pubis; AP and lateral of proximal half of affected femur with ruler or marker (at surgeon discretion); shoot through lateral	❖ **Imaging Knee**: 3 foot standing of limb at discretion of surgeon (responsibility of arthroplasty clinic to secure images) Additional films with ruler or marker at discretion of surgeon	❖ Lab Preop CBC, glucose, electrolytes, creatinine, type and screen (<28 days preop) -Base line ECG patient specific testing to monitor and achieve medical threshold defined in contract.	
Medical & Surgical Interventions		❖ Patient examination by arthroplasty team ❖ Plan prepared for all non-surgical patients ❖ Orthopaedic surgeon prescribed medications	❖ Patient specific based on contract and medical needs	❖ Prepare patient contract and review with patient and family and communicate & secure sign off. ❖ Send to GPs office. ❖ Patients referred to Perioperative Blood Conservation Programs if appropriate.
Activity/ Mobility		❖ Referrals per arthroplasty resource list		❖ Mobility / strengthening exercises in preparation for surgery ❖ Encourage/instruct in use of walking aid as appropriate to decrease pain and improve

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
				gait
Teaching/ Discharge		❖ Criteria for 2nd + visit and/or case management for Non-surgical patients may include: • Frail elderly • No family/support network • Complex issues (functional, medical, social) appointment (bring someone) • Communication issues • Unresolved issues or require investigation after 1st visit • Out of major center with limited access to resources • Injections		❖ Pre Op education session by Team member. ❖ Overview clinical path including experience and expectations ❖ Orient to education materials – handbook, video, site specific handouts, common questions, equipment needs, home adjustments, demonstrations and practice.
Pt/Family Responsibility		❖ Attend with patient participate, support, document, be informed, understand (via telephone if not	❖ Willing to work towards a timely surgical date and discharge ❖ Willing to assist patient at home and	❖ Attend contract discussion and signing, pre-op teaching sessions, other patient preparation efforts. ❖ Willing to work towards timely discharge dates

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
		available locally)	arrange equipment ❖ Prepare home and organize required post op equipment ❖ Notify GP/Medical Management Team and/or Arthroplasty Team if changes in medical or function status	❖ Comply with pre-surgery optimization programs ❖ Prepare home ❖ Family commits to assisting patient as determined
Equipment & Supplies		❖ Assessment equipment ❖ Goniometer Tape measure ❖ Stairs/steps ❖ Walking aids ❖ Stop Watch ❖ Patient skin wash package ❖ Teaching tools		**Total Hip/Knee** ❖ Patient package: • Surgery Patient Guidebook explaining aspects of intervention from beginning to end plus tools and instructions. • Equipment list for patients to organize for discharge (Friend or family, Vendors, RX or STELP, Health Unit) A • Available resources for patients (Home Care, Meals on Wheels, Life Line, etc.) Education Video/DVD • Hip kit (reacher, long handled shoe horn/ stocking aid/ long handles bath sponge)

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
				• Theraband (exercise elastic) exercise instructions and booklet for home use for prehab • Classroom with comfortable (tall) chairs and tables for patient to sit and write at, bed to demonstrate transfers • VCR, DVD and TV • Teaching crutches, walkers, • OT bath and dressing aids (raised toilet seat
Standards -All	❖ 100% of referrals appropriate Elective patients only – no emergent patients ❖ All patients to be fully assessed and evaluated and referred using Arthroplasty Referral Tool ❖ All patients to be imaged according to AOS Imaging standards ❖ All patients requiring internal medicine evaluation evaluated prior to referral using	❖ Patients to be booked and receive a clinic evaluation within 17 working days from acceptance of referral ❖ All patients with complete referral packages and who meet the arthroplasty access thresholds screened in. ❖ All referring providers informed within 2 working days of receipt of referral package if patient	❖ Patient did not proceed to surgery until all conditions met. ❖ Patient prepared medically by medical management team per contract. ❖ Home and workplace changes completed and confirmed. ❖ All patients to be tested per lab and ECG requirements ❖ Patient cleared for surgery minimum 4 weeks prior to surgery date.	❖ Patient specific contract signed off by patient/family member, orthopaedic surgeon, PC medical management lead physician ❖ RHA's provide resource availability profile daily (OR's, inpatient beds, sub acute beds, home care resources ❖ Surgical planning template to be completed for all patients (required services, dates for all required services, medical and surgical interventions identified, etc.) ❖ No bilateral joints at same time. ❖ Home OT visit performed for

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
	LPCI/ PCP/ AOS Tool and designated medically stable for surgery or can be stable within 4 months. ❖ All referral packages to included completed referral template, images, applicable consult reports and designation of LPCI/PCP responsibility for medical management. ❖ All referrals sent to designated Arthroplasty Clinic	screened in or out – if out reason given. ❖ All patients assigned to an arthroplasty surgeon and team based on next available or requested surgeon (if within standard waits) ❖ All patient to receive a clinic evaluation within 15 working days of being screened in (unless patient request a date beyond) ❖ Correct non-surgical or surgical disposition made for 100% of patients ❖ Outcome measurement tools completed on all patients (see care path). ❖ All patients comprehensively evaluated and assessed per AOS templates. ❖ Determination of	❖ Patients operated at = or < WCWL recommendations once declared surgically ready by surgeon.	selected patients ❖ Anesthesia consult completed for those patients identified. ❖ Patient contract completed using AOS template and patient sign off secured. ❖ Surgical consent signed Plan forwarded to medical management team & RHA Plan approved by Orthopaedics, Medical Management and RHA – ❖ Patient did not proceed to surgery until all conditions met. ❖ Patient prepared surgically by orthopaedic team. ❖ Home and workplace changes completed and confirmed. ❖ Patient cleared for surgery minimum 4 weeks prior to surgery date. ❖ Patients operated at = or < WCWL recommendations (< 4 weeks urgent, < 13 weeks semi-urgent, <26 weeks non-urgent) once declared surgically ready by surgeon.

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
		surgical or non-surgical made by orthopaedic surgeon. ❖ Non-surgical patient (requires orthopaedic surgeon assessment) Cannot be medical stable within 16 weeks: Morbid Obesity, BMI= or >40, Cognitive instability, Patient non-compliant, Dental disease (if surgical risk), Can be treated non-surgically, Untreated prostate or urinary problems ❖ Patient specific non-surgical treatment plan sent to referring provider . ❖ Patients requiring a mini standard plan, plan to be prepared and reviewed with patient at Evaluation & Detailed Assessing Appointment (1 visit only). ❖ Patients requiring a		

	Pre Referral & Referral	Ortho Clinic Evaluation & Detailed Assessment </= 17 Working Days from Referral	Medical Optimization Pre – Surgery <= WCWL Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready	Ortho Planning, Contracting and Optimization Pre-Surgery <= WCWL Patient Surgery Ready Patient Dependent If Not Ready Maximum 16 Weeks To Ready
		customized plan invited to attend a planning and educating session within 15 working days (2nd visit). ❖ Mini report/plan or comprehensive plan given to patient and patient understanding confirmed. ❖ Mini report/plan or comprehensive plan sent to referring physicians within 14 working days of patient's final appointment. ❖ 2nd opinion can be generated by referring physician ❖ Patient will see a second surgeon only not the team		

Arthroplasty Primary Hip & Knee Path – Pre Surgery and Surgery

	Surgery Prep	Surgery
Assessment/ Monitoring		❖ Nursing assessments and monitoring Per RHA/site policy ❖ Safety checks ❖ Surgeon sign site of incision and cut through signature in OR
Consults		❖ Anesthesia check in preop area
Tests/ Diagnostics		❖ Dependent upon patient need and physician discretion
Surgical Intervention		**Preop Area** ❖ Hair removal by clipper only ❖ Anesthesia administered 85% spinals (whether administered in preop or OR site dependent) **Operating Room** ❖ Anesthesia administered 85% spinals (whether administered in preop or OR site dependent) ❖ Time out check and site identification ❖ Foley catheter inserted on all patients (mechanical & patient comfort) ❖ Site preparation with tincture of chlorhexidine(first choice), Povidone/iodine (second choice) prep, 60% alcohol, & use iodine impregnated adhesive (Ioban) drape ❖ Tourniquets use on TKA at discretion of surgeon. Maximum pressure and inflation time to be guided by current practices, standards and guidelines. ❖ Pulse lavage to be available for use at surgeon's discretion -but no antibiotics ❖ Hemovac drains – No drains Hips or at surgeon's discretion. No drains Knees: MacKenzie, Burkart, van Zuiden, Bredo, Pear[redacted] Miller, deSouza, McMillan, Cinats –or at surgeon's discretion. ❖ Infiltration of joint with local anesthetic at surgeon's discretion.

	Surgery Prep	Surgery
Medications	❖ Patients to bring their own "medical management" medications.	❖ Preop Analgesic - Celecoxib (Celebrex) 200mg po and Oxycodone long acting (Oxycontin) 10mg-20mg po. If allergy, check with surgeon for patient specific treatment. ❖ Antiemetics – Dexamethasone 5-10mg IV before induction and Ondansetron 4-8mg IV at end of surgery ❖ Antibiotic Prophylaxis -Cefazolin with a single dose preop with an adjustment from 1 gram IV if < 80 kilos to 2 grams IV if > 80 kilos IV 60 minutes pre-skin incision. If patient has history of allergy to penicillin & if reaction was rash or hive will proceed with Cefazolin. If reaction was or could be anaphylaxis, throat swelling, or problem breathing use Vancomycin at 1 gram IV <120 minutes prior to incision or Clindamycin 600 milligrams IV <120 minutes prior to incision (surgeon's discretion). ❖ Entire antimicrobial infused minimum of 15 minutes prior to tourniquet inflated ❖ Aspiration Prophylaxis – Patients with a BMI >35, history of hiatus hernia, ulcer disease, GERD, and other conditions such as mentally challenged, severe dementia, upper motor neuron disease, previous GI surgery, GI motility disorders, etc. give Ranitidine 150 mg po and Metoclopramide 10 mg po with sip of water 2 hours preop. Then Dicitrate (0.67m) 30 ml po on call to the operating room (patients currently on H2 blockers should not receive Ranitidine. If time does not permit administration of of Ranitidine and Metoclopramide within 2 hours give Dicitrate only.
Nutrition	❖ Light dinner night before and no alcohol ❖ After 12 midnight no food or drink	
Activity/ Mobility	❖ As directed by Arthroplasty Team	
Teaching/ Discharge	❖ As directed by Arthroplasty Team	

	Surgery Prep	Surgery
Pt/Family Responsibility	❖ No lotion or grease to be used on affected limb 3-5 day prior to surgery. ❖ Chlorhexidine skin wash night prior to surgery (sponge provided to patient in Arthroplasty Clinic). ❖ Ensure prescriptions filled and bring all medications ❖ Bring logbook, reacher, labeled crutches and walker ❖ Accompany patient to the hospital/site at scheduled time	
Equipment & Supplies		❖ Meet COA or hospital association standards re. air exchanges ❖ Exhaust suits or hoods are to be available (3 per case) for surgeons who use them routinely ❖ Positioning devices as needed ❖ Joint Implants -appropriate implants and equipment for insertion, including a reasonable supply of backup equipment and implants to deal with normal anticipated problems such as equipment breakage or "droppage". For TKA, an appropriate set of equipment and prostheses to deal with unanticipated ligament deficiencies. ❖ Cerclage wire system ❖ All bone grafts must be pre-arranged ❖ Appropriate cement – antibiotic impregnated cement only used with those patients with increased risk of infection at surgeon's discretion -Appropriate cement mixing devices with porosity reduction at surgeon's discretion. ❖ Sutures – all types ❖ Dressings – petroleum jelly impregnated mesh

	Surgery Prep	Surgery
Standards -All	❖ Patients operated at = or < WCWL recommendations once declared surgically ready. ❖ All patient at designated surgical site at contracted time and date (no cancellations for operational reasons).	❖ 85% of all patients to receive spinal anesthesia ❖ Patient's surgery completed as scheduled with dedicated team assigned to each surgeon. Surgeons complete an average of 4 cases per 71/2 hour shift per month (90 minutes max. from incision to dressing) ❖ All cases start on time per schedule. ❖ OR turnaround from dressing on to incision next patient <30 minutes. ❖ Care path adhered to. ❖ Complication rate <.75% ❖ Resource notes: Capital Health 1 OR 5 days per week 7-1/2 hours per day; Calgary – at HRC 1-2 OR's 5 days per week 7-1/2 per day minimum; David Thompson – 1 OR 1 day per week 7-1/2 hours per day

Arthroplasty Primary Hip & Knee Path – Inpatient

	Day of Surgery	Post Op Day 1	Post Op Day 2 Home or Transfer Subacute or Rural	Post Op Day 3 Home or Transfer Subacute or Rural	Post Op Day 4
Assessment/ Monitoring	❖ Neurovascular Assessment and VS per program/ hospital protocol ❖ O2 sat > 90% or > baseline pre-op. Assess air entry ❖ Assess dressing ❖ Intake/output q shift- hemovac, urine, oral, IV ❖ PT/ OT ❖ Arthroplasty Team Case Manager and designated inpatient contact	❖ Neurovascular Assessment and VS per program/ hospital protocol ❖ Intake / output q shift ❖ O2 sat > 90% or > baseline pre-op. Assess air entry - Intake/output q shift- hemovac, urine, oral, IV ❖ PT / OT ❖ Arthroplasty Team Case Manager and designated inpatient contact	❖ Neurovascular Assessment and VS per program/ hospital protocol ❖ O2 sat > 90% or > baseline pre-op. Assess air entry ❖ PT / OT ❖ Arthroplasty Team Case Manager and designated inpatient contact	❖ Neurovascular Assessment and VS per program/ hospital protocol ❖ PT / OT ❖ Arthroplasty Team Case Manager and designated inpatient contact	❖ Neurovascular Assessment and VS per program/ hospital protocol ❖ PT / OT ❖ Arthroplasty Team Case Manager and designated inpatient contact
Consults	❖ Consults as Required Anaesthesia/ IM/ Cardiology/Pain Service	❖ Consults as Required	❖ Consults as Required	❖ Consults as Required	❖ Consults as Required
Tests/ Diagnostics	❖ Hgb: Excessive blood loss/cardiac history / hypotension, tachycardia, increased respirations	❖ CBC (including HGB, platelets, WBC, hematocrit) ❖ INR daily if patient on Coumadin prior to surgery ❖ Electrolytes PRN	❖ CBC (including HGB, platelets, WBC, hematocrit) ❖ Post-op X-rays Knees: AP & lateral of affected knee Hips: AP pelvis center 2"; shoot through lateral affected hip to include stem	❖ CBC (including HGB, platelets, WBC, hematocrit) ❖ Post-op X-rays If unable to do on post op day 2	❖ Patient specific if not discharged

Medical & Surgical Interventions	❖ O2 nasal prong 2 liters/min titrate prn ❖ Deep breathing & cough (DB&C) q1h ❖ Reinforce dressing prn ❖ Empty + re-prime hemovac when full ❖ Blood Transfusion: Hgb <100g/l signs and symptoms of impaired O2 delivery, heart rate >/= 100, SBP </= 90, RR >/= 20, Dyspnea, Syncope, Angina, Confusion, ECG ischemic changes. Action-give O2, transfuse packed red blood cells 1 unit at a time and reassess Hgb >/= 70 g/l and no sign of impaired O2 delivery. Action-monitor Hgb < 70 g/l and no signs and symptoms of impaired O2 delivery Action– transfuse red blood cells 1 unit at a time and reassess	❖ O2 nasal prong 2 liters/min titrate prn ❖ DB&C q1h ❖ Lock IV prn ❖ Remove hemovac am regardless of drainage ❖ Dressing change daily and p.r.n. ❖ D/C foley am	❖ D/C O2 if sats > 90% or at baseline pre-op ❖ DB&C q1h ❖ Maintain saline lock ❖ Dressing change daily and p.r.n	❖ DB& C q1h ❖ D/C saline lock ❖ If wound dry may discontinue dressing changes and leave incision open to air	❖ Incision open to air if dry ❖ Patient specific if not discharged
Medications	❖ IV as ordered ❖ Antiemetics for PONV Ondansetron 4mg IV X 1 dose on unit at first complaint of nausea. Metoclopramide 10 mg IV/po q4h prn Prochlorperazine	❖ IV as ordered ❖ Antiemetics for PONV Metoclopramide 10 mg IV/po q4h prn Prochlorperazine (Stemetil) 10 mg IV q8h prn Dimenhydrinate 25-	❖ Antiemetics for PONV Metoclopramide 10 mg IV/po q4h prn Prochlorperazine (Stemetil) 10 mg IV q8h prn Dimenhydrinate 25-50mg IV/po q4h prn	❖ Antiemetics for PONV Metoclopramide 10 mg po q4h prn Prochlorperazine Dimenhydrinate 25-50mg po q4h prn – ❖ Analgesic NSAIDS – Celecoxib	❖ Antiemetics for PONV Metoclopramide 10 mg po q4h prn Dimenhydrinate 25-50mg po q4h prn ❖ Analgesic NSAIDS – Celecoxib (Celebrex) 100mg-

9b

	(Stemetil) 10 mg IV q8h prn Dimenhydrinate 25-50mg IV/po q4h prn ❖ Analgesic: **NSAIDS** - Celecoxib (Celebrex) 100mg-200mg po BID (12 hrs after pre op dose) If allergy check with surgeon for pt specific treatment. ❖ **Narcotics** • Oxycodone Long Acting (Oxycontin) 10mg-20mg po BID times 5 scheduled doses if allergy check with surgeon for patient specific treatment • Oxycodone Long Acting 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn for break through pain or • Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn **If orals are ineffective then morphine** 1-3mg IV q1h prn piggybacked with infusion pump **If patient allergic to Morphine** then Hydromorphone 2-	50mg IV/po q4h prn ❖ Analgesic: **NSAIDS** – Celecoxib (Celebrex) 100mg-200mg po BID ❖ Narcotics: • Oxycodone Long Acting (Oxycontin) 10mg-20mg po BID times 5 scheduled doses • Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn for breakthrough pain or • Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn **If orals are ineffective then morphine** 1-3mg IV q1h prn piggybacked with infusion pump **If patient allergic to Morphine** then Hydromorphone 2-4mg orally (tab) q4-6h as needed or 1-2mg IV q4-6h as needed. ❖ Antibiotics: • Cefazolin at 1 gram IV <80 kilos or 2 grams IV >80 kilos q8hX3	❖ Analgesic: **NSAIDS** – Celecoxib (Celebrex) 100mg-200mg po BID ❖ **Narcotics** • Oxycodone (Oxycontin) 10mg-20mg po BID times 5 scheduled doses • Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn for breakthrough pain or • Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn • **If patient allergic to Morphine** then Hydromorphone 2-4mg orally (tab) q4-6h as needed or 1-2mg IV q4-6h as needed. ❖ **Anticoagulant**: **THR** – Dalteparin 5000 units S/C daily for a total of 27 days. **TKR** – Dalteparin 5000 units S/C daily for a total of 14 days **If patient on vitamin K antagonist Preoperatively** postoperatively, goal	(Celebrex) 100mg-200mg po BID ❖ **Narcotics:** • Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn or • Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn ❖ Anticoagulant **THR** – Dalteparin 5000 units S/C daily for a total of 27 days. **TKR** – Dalteparin 5000 units S/C daily for a total of 14 days **If patient on vitamin K antagonist Preoperatively** – pre op dosage ordered by consultant, postoperatively, goal is to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Bowel routine – Docusate Sodium 100 mg oral 2 X/day and Sennocide 2 tablets oral at bedtime • Glycerine suppository PRN Phosphate enema rectally PRN) ❖ Discharge	200mg po BID ❖ **Narcotics:** • Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn or • Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn ❖ Anticoagulant **THR** – Dalteparin 5000 units S/C daily for a total of 27 days. **TKR** – Dalteparin 5000 units S/C daily for a total of 14 days **If patient on vitamin K antagonist Preoperatively** – pre op dosage ordered by consultant, postoperatively, goal is to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Bowel routine – Docusate Sodium 100 mg oral 2 X/day and Sennocide 2 tablets oral at bedtime • Glycerine suppository PRN Phosphate enema rectally PRN) ❖ Discharge prescriptions ordered and filled at

	4mg orally (tab) q4-6h as needed or 1-2mg IV q4-6h as needed ❖ Antibiotics: • Cefazolin at 1 gram IV <80 kilos or 2 grams IV >80 kilos – q8hX3 doses. (start 8 hrs after initial preop dose given) If allergy to Cefazolin then Vancomycin 1 gm IV X2 doses q12h or Clindamycin 600mg IV q8h x 2 doses. – ❖ Anticoagulant If traumatic spinal check with anaesthesia administration of anticoagulant THR – Dalteparin 2500 units S/C 6 hours post op (this is day 1 of 28 days) TKR – Start on post op day one **If patient on vitamin K antagonist** postoperatively, goal is to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Reorder pre-op medications	❖ Anticoagulant THR – Dalteparin 5000 units S/C daily for a total of 27 days. TKR – Dalteparin 5000 units S/C daily for a total of 14 days **If patient on vitamin K antagonist** postoperatively, goal is to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Bowel routine – Docusate Sodium 100 mg oral 2 X/day and Sennocide 2 tablets oral at bedtime Glycerine suppository PRN Phosphate enema rectally PRN	is to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Bowel routine – Docusate Sodium 100 mg oral 2 X/day and Sennocide 2 tablets oral at bedtime • Glycerine suppository PRN Phosphate enema rectally PRN) • Discharge prescriptions ordered and filled at discharge pharmacy or delivered via community pharmacy including: Anticoagulation, analgesics	prescriptions ordered and filled at discharge pharmacy or delivered via community pharmacy including: Anticoagulation, analgesics	discharge pharmacy or delivered via community pharmacy including: Anticoagulation, analgesics

Nutrition	❖ DAT -High Fibre (Diet restrictions as ordered or in place preoperatively)	❖ DAT -High Fibre (Diet restrictions as ordered or in place preoperatively)	❖ DAT -High Fibre	❖ DAT -High Fibre	❖ DAT -High Fibre
Activity/ Mobility	❖ PT exercises to begin 4 hours post arrival on unit ❖ Use of any active devices e.g. slider board, slings ❖ Encourage positioning side, side, back q2h Up standing or walking as able evening of surgery 1 -2 x depending on return time to unit Knee and Hip all weight bearing as tolerated If pain block assess for control ❖ Foot & Ankle exercises (F/A) -q1h ❖ Bilateral extremity isometric exercises ❖ Encourage use of non-affected limbs	❖ Up in chair for meals 2 – 3X ❖ PT treatment 2 -3 x per day ❖ Up mobilizing in room and bathroom/hallway 3 x per day, increasing distance each time (assisted as required) ❖ Use walker/crutches for mobilization ❖ Up in chair for short periods -Transfers in/out of bed – assisted as required -Ensure raised toilet seat/commode is in bathroom -F/A exercises	❖ AM care in bathroom ❖ Up in chair for meals x 3 ❖ PT treatment 2 -3 x per day ❖ Up mobilizing in room and bathroom/hallway 3 – 5 x per day, increasing distance each time (assisted as required) ❖ Use walker/crutches for mobilization ❖ Ambulate to/from bathroom (with assistance as needed) ❖ Progressive sitting tolerance (15-30min at a time) ❖ Progress toward independent bed/chair transfers ❖ Independent ROM exercises between PT visits ❖ ADL practice with adaptive equipment ❖ F/A exercises	❖ AM care in bathroom ❖ Up in chair for meals x 3 ❖ PT treatment 2 -3 x per day on unit / department ❖ Up mobilizing in room and bathroom/hallway 5 x per day, increasing distance each time (independent) (maintain any weight bearing restrictions) using aides, walker/crutches ❖ Ambulate to/from bathroom (with assistance as needed) ❖ Ambulation on stairs ❖ Independent in and out of bed/chair ❖ Independent with bath and car transfers ❖ Independent self care and dressing using adaptive equipment ❖ Independent ROM exercises between PT visits ❖ F/A exercises	❖ AM care in bathroom ❖ Up in chair for meals ❖ Independent : Transfers Ambulation Self care & dressing Stairs Dressing/self care ❖ Patient specific if not discharged

Teaching/ Discharge	❖ Precautions reinforced for movement and positioning	❖ Precautions reinforced ❖ Teach correct transfer techniques (bed/chair – avoiding hip adduction, flexion past 90 and internal rotation with THR patients) ❖ Gait correction ❖ Confirm/review discharge plan with patient ❖ Contact made with rural/sub-acute to confirm transfer a.m. of POD3 or sooner ❖ Confirm home support services if required	❖ Home Exercises – ❖ Precautions reviewed ❖ Anticoagulant administration taught ❖ Analgesic administration taught ❖ Resumption of pre op meds upon discharge ❖ Discharge instructions reinforced/completed by nurse/PT/OT ❖ Confirm discharge location ❖ Confirm home support services if required ❖ Arrange and confirm non-planned services if needed for patients going home ❖ Discharge Criteria Sub Acute, Rural facilities or Home see next two columns	❖ Home Exercises ❖ Precautions ❖ Anticoagulant administration taught ❖ Analgesic administration taught ❖ Resumption of pre op meds upon discharge ❖ Discharge instructions reinforced/completed by nurse/PT/OT ❖ Subacute or Rural facilities patients discharge instructions reinforced/ completed by nurse ❖ Transfers to subacute ❖ Criteria for discharge to Sub-Acute unable to manage environment at residence e.g. no home support, difficult living arrangements (stairs, levels, access to bath/ kitchen) • Frail elderly with comorbidities • Daily need for rehabilitative services and/or no or limited access to	❖ Home Exercises ❖ Precautions ❖ Anticoagulant administration taught ❖ Analgesic administration taught ❖ Resumption of pre op meds upon discharge ❖ Discharge instructions reinforced/completed by nurse/PT/OT ❖ Confirm follow-up appointments ❖ Criteria for discharge home: • Independent with or without own support for ADL and mobility to access rehabilitative services and follow-up e.g. • Able to get in and out of bed • Able to toilet • Safe with walker or crutches • Safe on stairs • Basic/instrumental activities of living • Understands and practices precautions Understands and able to perform

6				rehabilitation services • Post operative complications	recommended exercises • Knee – minimum 70 degree flexion (see below) ❖ Criteria for access to community physical therapy **Knee** • <70° flexion and/or • >15° flexion contracture >15° quad lag and/or grade 2+ strength and /or unable to straight leg raise • For pain and swelling control • For gait pattern and/or balance correction or control **Hip** • <45° flexion and/or >15° flexion contracture • < grade 2+ flexor strength and/or < grade 2 abductor strength • For gait pattern and/or balance correction or control • Significant edema in surgical leg

Standards -All	▪ Patient discharged without complications as planned and scheduled. ▪ Standardized care path adhered to (see care path) ▪ Median LOS of 108 hours from check-in for patients discharged home and median LOS of <76 hours for patient discharged to sub acute/rural facility. ▪ Contract, clinical path and patient plan adhered to unless ordered different by physician. ▪ Medical management provided. ▪ Surgical management provided. ▪ Discharge order issued as per plan. ▪ Complication rate < .75%. **Resource notes**: Capital Health – 16 - 20 inpatient beds at Royal Alec and 5 sub acute beds at Grandview; Calgary Region – 20 inpatient beds at HRC and 6 sub acute beds at HRC; David Thompson – 5 inpatient beds at Red Deer Regional and 2 sub acute beds at Innisfail

Arthroplasty Primary Hip & Knee Path – Recovery

	Sub-Acute or Rural (LOS 5-7 Days)	0-14 Days PostOp @ Home Patient	14 Days-6 Weeks Post Inpatient Discharge @ Home Patient	6 –12 Weeks Post Inpatient Discharge @ Home Patient	12 Weeks – 1 Year Then Every 2 Years
Assessment/ Monitoring	❖ Neurovascular Assessment and VS per facility protocol ❖ Arthroplasty Team Case Manager and LPCI/PCP medical management	❖ Arthroplasty Team At 14 days post op patient visit re. swelling, gait, pain, precautions, exercise, mobility, post op complications (including infection, DVT). Confirm using walking aid, bathroom equipment, dressing aids ❖ Arthroplasty Team Case Manager and LPCI/PCP medical management.	❖ Arthroplasty Team At 6 weeks post inpatient discharge patient visit re. swelling, gait, pain, precautions, exercise, mobility, post op complications (including infection, DVT's etc), etc Confirm using walking aid, bathroom equipment, dressing aids 6 week assessment by surgeon ❖ Arthroplasty Team Case Manager and LPCI/PCP medical management	❖ Arthroplasty Team At 12 weeks post inpatient discharge Womac, SF 36, Health Utilities Index, Framingham, Harris Hip, Knee Society 12 weeks post inpatient discharge patient visit re. swelling, gait, pain, precautions, exercise, mobility, post op complications (including infection, DVT's etc), etc Confirm using walking aid, bathroom equipment, dressing aids 12 week assessment by surgeon ❖ Arthroplasty Team Case Manager and LPCI/PCP medical management	❖ Arthroplasty Team At 1 year and then every 2 years post inpatient discharge Womac, SF 36, Health Utilities Index, Framingham, Harris Hip, Knee Society Gait, pain, exercise, mobility
Consults	❖ Consults as required	❖ Outpatient Physio/Home Care Physio if ROM deteriorated or knee flex below 70 degrees (TKR patients) ❖ OT if needed for home ❖ GP/Medical Management Team	❖ Outpatient Physio if ROM deteriorated ❖ OT if needed ❖ GP/Medical Management Team	❖ Outpatient Physio if ROM deteriorated ❖ OT if needed ❖ GP/Medical Management Team	

Tests/ Diagnostics	❖ LmwH administration monitor platelets 2 x weekly during duration of treatment	❖ LmwH administration monitor platelets 2 x weekly during duration of treatment	❖ LmwH administration monitor platelets 2 x weekly during duration of treatment	❖ **3 Months:** • X-rays of surgical site Knee – AP / Lateral / Skyline view Hip – AP / Lowenstein Lateral + AP pelvis center 2" low	❖ X-rays at 1 year and then every 2 years Hips: AP pelvis center 2" low; shoot through lateral affected hip Knees: AP & lateral of affected knee; Merchant view of patella
Medical & Surgical Interventions	❖ Dressing changes if needed	❖ Remove sutures/staples at 14 days post op			
Medications	❖ Antiemetics for PONV Metoclopramide 10 mg po q4h prn Dimenhydrinate 25-50mg po q4h prn ❖ Analgesic NSAIDS – Celecoxib (Celebrex) 100mg-200mg po BID Narcotics – Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn for breakthrough pain or Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn ❖ Anticoagulant THR – Dalteparin 5000 units S/C daily for a total of 27 days. TKR – Dalteparin 5000 units S/C daily for a total of 14 days If patient on vitamin K antagonist Preoperatively – postoperatively, goal is to keep INR range	❖ Antiemetics for PONV Metoclopramide 10 mg po q4h prn Dimenhydrinate 25-50mg po q4h prn ❖ Analgesic NSAIDS – Celecoxib (Celebrex) 100mg-200mg po BID Narcotics – Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn Anticoagulant THR – Dalteparin 5000 units S/C daily for a total of 27 days. TKR – Dalteparin 5000 units S/C daily for a total of 14 days If patient on vitamin K antagonist Preoperatively – postoperatively, goal is	❖ Analgesic NSAIDS – Celecoxib (Celebrex) 100mg-200mg po BID ❖ Narcotics • Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn or Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn ❖ Anticoagulant THR – Dalteparin 5000 units S/C daily for a total of 27 days. If patient on vitamin K antagonist Preoperatively – postoperatively, goal is to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Oral Medications	❖ Analgesic NSAIDS – Celecoxib (Celebrex) 100mg-200mg po BID ❖ Narcotics • Oxycodone 5mg with Acetaminophen (Percocet) 1-2 tabs po q4h prn or Acetaminophen with Codeine 30 mg (Tylenol #3) 1-2 tabs po q4h prn ❖ Oral Medications	

	between 2.0 – 3.0 with a target of 2.5 ❖ Bowel rou[illegible] – Docusate Sodium 100 mg oral 2 X/day and Sennocide 2 tablets oral at bedtime ❖ Glycerine suppository rectally pm. ❖ Phosphate Enema ❖ Oral Medications ❖ Platelets	to keep INR range between 2.0 – 3.0 with a target of 2.5 ❖ Bowel routine Docusate Sodium 100 mg oral 2 X/day and Sennocide 2 tablets oral at bedtime – ❖ Glycerine suppository rectally pm. ❖ Phosphate Enema ❖ Oral Medications			
Nutrition	❖ DAT -High Fibre	❖ DAT – maintain well balanced diet or diet as specified re. Canada Food Guide	❖ DAT – maintain well balanced diet or diet as specified re. Canada Food Guide	❖ DAT – maintain well balanced diet or diet as specified re. Canada Food Guide	❖ DAT – maintain well balanced diet or diet as specified re. Canada Food Guide
Activity/ Mobility	❖ Assist with AM care as required ❖ Up in chair for meals – ❖ PT exercises 2 -3 x per day on unit ❖ Up mobilizing in room and bathroom/hallway a minimum of 5 x per day, increasing distance each time (independent) (maintain any weight bearing restrictions) using aides, walker/crutches ❖ Up to bathroom at night ❖ Independent ROM exercises between PT visits ❖ F/A exercises ❖ Work toward independence Transfers Ambulation Self care & dressing Stairs	❖ Independent Transfers Ambulation Self care & dressing Stairs ❖ Home exercise program ❖ Increasingly return to normal daily activities as tolerated ❖ Walking	❖ Independent Transfers Ambulation Self care & dressing Stairs ❖ Home exercise program ❖ Weight bearing as tolerated & full weight bearing progress to wean down aids to cane.if able by 6 weeks Continue exercise program until 6 week visit ❖ Walking	❖ Independent Transfers Ambulation Self care & dressing Stairs ❖ Upgraded home exercise program ❖ If cleared by surgeon at 6 week appointment full weight bearing. Progress to phase II strengthening exercises (gravity resist, theraband, light weights, ROM) and gently progress ROM into flexion past 90 degrees abduction post neutral ❖ Walking -Exercise program in community as advised	❖ Independent ❖ Normal daily activities ❖ Walking ❖ Exercise program in community

	❖ Dressing in street clothes (with/without assistance as needed)				
Teaching/ Discharge	❖ Anticoagulant self administration taught and supervised – ❖ Analgesic administration taught ❖ ADL instruction Dressing/Tub transfers/Car transfers ❖ Home Exercises ❖ Discharge instructions reinforced/completed by nurse ❖ Confirm follow-up appointments ❖ Criteria for discharge home Independent with or without own support for ADL and mobility to access rehabilitative services and follow-up e.g. Able to get in and out of bed Able to toilet Safe with walker or crutches Safe on stairs Basic/instrumental activities of living Understands and practices precautions Understands and able to perform recommended exercises Knee – minimum 70degree flexion (see below) Has appropriate	▪	▪	▪	▪

	discharge destination and equipment in place ❖ Criteria for access to community physical therapy Knee <70° flexion and/or >15° flexion contracture >15° quad lag and/or grade 2+ strength and /or unable to straight leg raise For pain and swelling control For gait pattern and/or balance correction or control Hip <45° flexion and/or <15° flexion contracture < grade 2+ flexor strength and /or < grade 2 abductor strength For gait pattern and/or balance correction or control Significant edema in surgical leg				
Pt/Family Responsibility	❖ Encourage independent exercise and mobilization ❖ Home prepared ❖ Support available – ❖ Arrangements made for transport ❖ Transport home at 0900h ❖ Prescriptions picked up	❖ Encourage independent exercise and mobilization ❖ Support at home as needed (laundry, driving, meal prep, etc)	❖ Encourage independent exercise and mobilization ❖ Support at home as needed (laundry, driving, meal prep, etc)	❖ Encourage independent exercise and mobilization and gradual return to normal activity	❖ Encourage normal function

Equipment & Supplies	❖ Dressing aids for patients to use	❖ Confirm using walking aid, bath room equipment, dressing aids			
Standards - All	❖ Patient discharged without complications as planned and scheduled. ❖ Standardized care path adhered to ❖ Contract and plan adhered to.	❖ Patient achieved outcomes as defined in contract at 3 months Patients sent home from hospital seen at 14 days post op, 6 weeks post discharge, 3 months post discharge, 1 year post discharge. Patients sent to sub acute or rural seen at 6 weeks post discharge, 3 months post discharge, 1 year post discharge Complication rate of < .75% ❖ Contract and plan adhered to. ❖ 100% of primary joint patients monitored every 2 years.			

APPENDIX C

Health Research Ethics Board Approval – Alberta Arthroplasty Study

Health Research Ethics Board Approval – Sub-study

Health Research Ethics Board

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January 26, 2005

Our file #5660

Dr. D W C. Johnston
Division of Orthopaedic Research
1F1.52 WMC

Dear Dr. Johnston

Re: **A randomized controlled prospective study to examine the efficacy of a new evidence based arthroplasty care model versus the existing conventgional approach for patients with severe degenerative joint disease (DJD) of the hip or knee. Alberta Arthroplasty Study, protocol dated October 6, 2004.**

Thank you for submitting the above study to the Research Ethics Board. Dr. Morrish has reviewed your application and has approved it on behalf of the committee. He has also approved the patient information sheet and consent dated December 1, 2004. I note that your contact phone number on page 2 is different from the number given on your application, but suspect that it is your clinical office. Please ensure that the number is correct. We note that the study has already been reviewed and approved by the Conjoint REB in Calgary

Your approval form is enclosed. In order to comply with the Health information Act, a copy of the approval form is being sent to the Office of the Information and Privacy Commissioner.

Next year, a few weeks prior to the expiration of your approval, a Progress Report will be sent to you for completion. If there have been no major changes in the protocol, your approval will be renewed for another year. All protocols may be subject to re-evaluation after three years.

For studies where investigators must obtain informed consent, signed copies of the consent form must be retained, and be available on request. They should be kept for the duration of the project and for a full calendar year following its completion.

Approval by the Health Research Ethics Board does not encompass authorization to access the patients, staff or resources of Capital Health or other local health care institutions for the purposes of research. Enquiries regarding Capital Health administrative approval, and operational approval for areas impacted by research, should be directed to the Capital Health Regional Research Administration office, #1600 College Plaza, phone 407-1372. For administrative approval from Caritas, and operational approval for areas impacted by research, should be directed to the Caritas Research Steering Committee, at 930-5274

Yours sincerely

Judith Abbott

Judith R. Abbott
Administrative Coordinator
Health Research Ethics Board (Biomedical Panel)

/ja

Health Research Ethics Board

213 Heritage Medical Research Centre
University of Alberta, Edmonton, Alberta T6G 2S2
p.780.492.9724 (Biomedical Panel)
p.780.492.0302 (Health Panel)
p.780.492.0459
p.780.492.0839
f.780.492.7808

HEALTH RESEARCH ETHICS APPROVAL FORM

Date: April 2006

Name of Applicant: **David Magee**

Organization: **UA**

Department: **Physical Therapy**

Project Title: **Analysis of the factors affecting duration of acute inpatient hospital stays after hip and knee arthroplasty: A focus on "modifiable" and "non modifiable" determinants.**

The Health Research Ethics Board (HREB) has reviewed the protocol for this project and found it to be acceptable within the limitations of human experimentation.

The approval for the study as presented is valid for one year. It may be extended following completion of the yearly report form. Any proposed changes to the study must be submitted to the Health Research Ethics Board for approval. Written notification must be sent to the HREB when the project is complete or terminated.

Special Comments:

Glenn G. Griener
Dr. Glenn Griener, PhD
Chair of the Health Research Ethics Board
(B: Health Research)

MAY 04 2006
Date of Approval Release

File Number: B-280406

UNIVERSITY OF ALBERTA

Capital Health

CARITAS HEALTH GROUP

APPENDIX D

Conjoint Health Research Ethics Board Approval – Alberta Arthroplasty Study

Conjoint Health Research Ethics Board Approval – Sub-study

FACULTY OF MEDICINE | UNIVERSITY OF CALGARY

OFFICE OF MEDICAL BIOETHICS
Room 93 Heritage Medical Research Bldg
3330 Hospital Drive NW
Calgary, AB Canada T2N 4N1
Telephone: (403) 220-7990
Fax: (403) 283-8524
Email: omb@ucalgary.ca

2005-01-04

Dr. C.B. Frank
Department of Surgery
University of Calgary
Calgary, Alberta

Dear Dr Frank:

RE: A Randomized Controlled Prospective Study to Examine the Efficacy of a new Evidence Based Arthroplasty Care Model versus the Existing Conventional Approach for Patients with Severe Degenerative Joint Disease (DJD) of the Hip or Knee

Grant ID: 17951

The above-named research project including the study protocol (Version dated October 6, 2004), the Baseline Patient Interview Form (Version dated July 21, 2004), the Patient Questionnaire Forms (Version dated July 6, 2004), the Screening Form (Version dated July 23, 2004), the Follow-Up Patient Interview Form (Version dated July 23, 2004), the Clinic Chart Review Form (Version dated July 21, 2004), the Hospitalization Information Sheet (Version dated July 23, 2004), the Administrative Data Sheet (Version dated July 23, 2004), and the Revised Consent Form (Version dated December 20, 2004) has been granted ethical approval by the Conjoint Health Research Ethics Board of the Faculties of Medicine, Nursing and Kinesiology, University of Calgary, and the Affiliated Teaching Institutions. The Board conforms to the Tri-Council Guidelines, ICH Guidelines and amendments to regulations of the Food and Drug Act re clinical trials, including membership and requirements for a quorum.

You and your co-investigators are not members of the CHREB and did not participate in review or voting on this study.
Please note that this approval is subject to the following conditions:

(1) appropriate procedures for consent for access to identified health information has been approved,
(2) a copy of the informed consent form must have been given to each research subject, if required for this study;
(3) a Progress Report must be submitted by 2006-01-04, containing the following information:
    i) the number of subjects recruited;
    ii) a description of any protocol modification;
    iii) any unusual and/or severe complications, adverse events or unanticipated problems involving risks to subjects or others, withdrawal of subjects from the research, or complaints about the research;
    iv) a summary of any recent literature, finding, or other relevant information, especially information about risks associated with the research;
    v) a copy of the current informed consent form;
    vi) the expected date of termination of this project.
(4) a Final Report must be submitted at the termination of the project.

Please accept the Board's best wishes for success in your research.
Yours sincerely,

Christopher J. Doig, MD, MSc, FRCPC

Chair, Conjoint Health Research Ethics Board

CJD/km
c.c. Adult Health Research Committee Dr. R. Lafreniere (information) Research Services Kelly Novak (Coordinator)
Office of Information & Privacy Commissioner

FACULTY OF MEDICINE | UNIVERSITY OF CALGARY

OFFICE OF MEDICAL BIOETHICS
Room 93, Heritage Medical Research Bldg
3330 Hospital Drive NW
Calgary, AB, Canada T2N 4N1
Telephone: (403) 220-7990
Fax: (403) 283-8524
Email: omb@ucalgary.ca

July 12, 2006

Dr. C.B. Frank
Department of Surgery
University of Calgary
Calgary, Alberta

Dear Dr. Frank:

Re: A Randomized Controlled Prospective Study to Examine the Efficacy of a new Evidence Based Arthroplasty Care Model versus the Existing Conventional Approach for Patients with Severe Degenerative Joint Disease (DJD) of the Hip or Knee

Grant ID: 17951

Your request to modify the above-named research protocol has been reviewed and approved.

I am pleased to advise you that it is permissible for you to use the revised protocol based on the information contained in your correspondence of June 5, 2006.

A progress report concerning this study is required annually, from the date of the original approval 2005-01-04. The report should contain information concerning:

- (i) the number of subjects recruited;
- (ii) a description of any protocol modification;
- (iii) any unusual and/or severe complications, adverse events or unanticipated problems involving risks to subjects or others, withdrawal of subjects from the research, or complaints about the research;
- (iv) a summary of any recent literature, finding, or other relevant information, especially information about risks associated with the research;
- (v) a copy of the current informed consent form;
- (vi) the expected date of termination of this project;

Thank you for the attention which I know you will bring to these matters.

Yours sincerely,

Ian Mitchell, MA, MB, FRCPC
Acting Chair, Conjoint Health Research Ethics Board
IM/eb

c.c. Adult Research Committee Mr. Kelly Novak

FAX
→ M O
943-3332
→ Betty
220 7990
1
DATE: July 13/06

APPENDIX E

Alberta Arthroplasty Study Consent

UNIVERSITY OF CALGARY
FACULTY OF MEDICINE

ALBERTA BONE & JOINT HEALTH INSTITUTE

CONSENT FORM

Title of Project: **A Randomized Controlled Prospective Study to Examine the Efficacy of a new Evidence Based Arthroplasty Care Model versus the Existing Conventional Approach for Patients with Severe Degenerative Joint Disease (DJD) of the Hip or Knee**

Principal Investigator: **Dr. Cy Frank, Department of Surgery, University of Calgary, Phone: (403) 220-6881, Fax: (403) 283-7742, E-mail: cfrank@ucalgary.ca**

Co-Investigator: **Dr. Bill Johnston, Orthopedic Surgeon, University of Alberta, Phone: (780) 439-4945, Fax: (780) 439-0396, E-mail: BJohnsto@cha.ab.ca**

Sponsor: **Alberta Bone and Joint Health Institute**

This consent form, a copy of which has been given to you, is only a part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form.

Introduction

Degenerative joint disease (DJD) affects over ten percent of the Alberta population, and osteoarthritis (OA) and rheumatoid arthritis (RA) represent the most common causes of DJD. Seventy percent of patients over the age of 70 have been identified as having radiographic evidence of OA and arthritis represents the second most common reason for a visit to a physician. During the course of their suffering many patients will try alternative medications and therapies as they struggle to find relief of their symptoms. The alleviation of symptoms related to pain, stiffness, and loss of function demands substantial resources at all levels of the health care system. Hip and knee replacements (arthroplasty) have been recognized as one of the most effective surgical interventions in the management of this condition.

Purpose of Research

To determine if a New Arthroplasty Care Model, established on evidence-based medicine and best practices, improves patient outcomes and decreases health resource utilization on a per patient basis in patients with severe degenerative joint disease (DJD) of the hip or knee in Alberta.

Procedures

If you agree to participate, you will be randomized into one of two study groups. The chances of being in either group are a 50/50 chance i.e. like a toss of a coin. Group A (the intervention group) will be asked to receive care for their hip or knee in a different clinic for the duration or their treatment. Group B (the control group) will be required to continue their treatment as per usual standard of care. No group will receive less medical attention or quality of treatment than what is currently the standard today. If you agree to participate in this study, data will be collected from your medical charts, interviews, and from data maintained within the databases at Alberta Health and Wellness. Your Alberta Health Care Number is therefore required so that the study can obtain your information from the databases in Alberta Health and Wellness.

If you participate in the study and are randomized into Group A you will fall into one of three paths for patient selection. These paths include those patients that have been seen by an orthopedic physician but have no surgery date, existing patients that have not been seen, and new patients from selected sites. Depending on your path, your time waiting for surgery may be shortened. If you choose not to participate in the study, your position in line for surgery will remain as it was in the existing system. If you withdraw during the study, your information captured may be included in the research. Interviews and data collection will take place initially when the study begins and every six months after that for a total of eighteen months.

Risks and Inconveniences

All information captured during the data analysis process will comply with the Health Information Act and will be stored and maintained in a strictly confidential manner. All data will be secured and only grouped non-identifiable information will be released in reports, publications or presentations. Data that could potentially identify you will not be collected.

Participation Withdrawal

Although it is preferred that you will remain a participant, you are free to withdraw at any time without risk of adverse consequences.

Benefits

By participating in this study, you are providing the orthopaedic surgeons and other health professional's information to help them make decisions regarding the best model of care for patients with degenerative joint disease of the hip or knee in Alberta. The results of this study will help to improve care and quality of life for patients with hip and knee conditions in Alberta.

Participant Responsibilities

1. To read, understand, and complete the consent form
2. Participate in baseline and follow-up data collection forms and questionnaires
3. Provide your Alberta Health Care number and allow Alberta Health and Wellness to generate patient record information
4. Provide a contact number and allow a member of the research team to contact you to arrange follow-up visits
5. Allow the use of your non-identifiable data for any future Arthroplasty related studies, provided University of Calgary Conjoint Ethics Board approval has been granted.

Study Costs

There will be no financial compensation for participating in this study.

Compensation for Injury

In the event that you suffer injury as a result of participating in this research, no compensation will be provided to you by the Alberta Bone and Joint Health Institute, the University of Calgary, the Calgary Health Region or the Researchers. You still have all your legal rights. Nothing said in this consent form alters your right to seek damages.

Questions

If you have any questions about this study you can contact your orthopaedic surgeon at any time.

Research Concerns

If you have any concerns about any aspect of the research project, you may contact the Patient Concerns Office of the Calgary Health Region at 1-866-408-5465.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the project and agree to participate as a subject. In no way does this waive your legal rights or release the investigator, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without jeopardizing your health care. If you have further questions concerning matters related to this research, please contact your orthopaedic surgeon.

If you have any questions concerning your right as a possible participant in this research, please contact Pat Evans, Associate Director, Internal Awards, Research Services, University of Calgary, at (403)220-3782.

Signature of Research Participant	Printed Name	Date
Patient Healthcare Number	Daytime Phone	Additional Phone
Signature of Investigator/Delegate	Printed Name	Date
Witness Signature	Printed Name	Date

The University of Calgary Conjoint Research Ethics Board has approved this research study.
A copy of this consent form has been given to you to keep for your records and reference.

Revised 20December 2004

APPENDIX F

Comorbidities List

Comorbidities List

- **Heart Disease**
- **High Blood Pressure**
- **Lung disease**
- **Diabetes Mellitus**
- **Stomach Ulcers/Gastrointestinal Disease**
- **Liver Disease**
- **Kidney Disease**
- **Anemia or other blood diseases**
- **Cancer**
- **Depression or Anxiety**
- **Back Pain**
- **Thyroid Disease**

APPENDIX G

Sample Size Calculation

SAMPLE SIZE CALCULATIONS

The sample size was calculated as follows:

Significance level (α) = 0.05

Power ($\beta - 1$) = 0.80

For men independent predictor of LOS – number of comorbid conditions ($R^2 = 0.19$) (Wolfe, 1993)*

Since $r = \sqrt{R^2}$, $r = \sqrt{0.19} = 0.44$

Formula ((Norman and Streiner 2000):

$$n = \frac{(Z_\alpha + Z_\beta\sqrt{1 - r^2})^2 + 2}{(r)^2}$$

same as $$n = \frac{(Z0.025 + Z0.8\sqrt{1 - r^2})^2}{(r)^2} + 2$$

Same as $$n = \frac{(1.96 + 0.84\sqrt{1 - 0.44^2})^2}{(0.44)^2} + 2$$

$$n = 40.05$$

Based on multiple regression and the sample size rule of 10 (Norman and Streiner, 2000), a sample size of 40 for the first variable and 10 subjects for each of the 11 variables, for a total of 150 subjects are needed.

** Correlation coefficients were not widely available in the literature for the sub study variables. Sample size calculation was based on the one available correlation between males and comorbidities. The lack of published statistics in the literature could be due to journal publication guidelines.

APPENDIX H

Approval for Data Analysis by 8 Participant Orthopaedic Surgeons

Application Process for Sub Protocol Requests - Alberta Bone and Joint Health Institute

February 03, 2006

Re: Approval of Research Protocol

Dear Orthopaedic Surgeon,.

I am presently completing my Masters of Science, Rehabilitation Medicine,University of Alberta. My research topic is Analysis of the Factors Affecting Duration of Acute Inpatient Hospital Stay after Hip and Knee Arthroplasty: A Focus on "Modifiable" and "Non Modifiable" Determinants.

The purpose of this study is to determine which modifiable and non modifiable factors best predict length of stay in the acute care hospital setting after TKA and THA when care is standardized. The factors that will be studied will include age, gender, type of surgery, co morbidities, BMI, social support/living status, home environment, self motivation inventory, WOMAC and SF36. Subjects for the study will be Calgary TJA patients, from The Alberta Arthroplasty Study. By determining the predictable factors, it is hoped that clinicians can implement appropriate interventions in the pre-habilitation phase of the arthroplasty continuum to assist patients in addressing physical and psychosocial factors to prevent increased LOS.

I am requesting your approval, signature below, for the undertaking of this study, which will adhere to the Sub-Protocol Requests Policies and Procedures of the Alberta Bone and Joint Institute.

Dr. G. Abelseth ____________________
Dr. B. Burkart ____________________
Dr. K. de Souza ____________________
Dr. H. Dougall ____________________
Dr. J. MacKenzie ____________________
Dr. S. Miller ____________________
Dr. L. van Zuiden ____________________
Dr. J. Werle ____________________

Sincerely,

Mo Donald BScPT

ALBERTA
BONE & JOINT HEALTH
INSTITUTE

STANDARD OPERATING PROCEDURES MANUAL

Title: **Sub-Protocol Requests**

Procedure Number: KC_002

Responsible Party/Parties:

Role: Research Manager

Name (Current): Katherine Gooch

Scope:

Development of sub protocols will be undertaken to meet the objectives and goals outlined for specific projects undertaken by the Alberta Bone and Joint Health Institute (ABJHI).

Process:

The process for approval of protocols within this project is as follows:

1. All sub protocols should be formatted in a similar manner which will include: 1) title 2) objective 3) background 4) methods 5) deliverables 6) timeline 7) budget 8) investigators 9) references. The protocols may be from 2 to 10 pages in length excluding references and appendices.

2. These protocols are to be initially submitted to the ABJHI Research Manager who will be responsible for reviewing each sub-protocol for completeness and project applicability. Sub-protocols may be submitted for additional comments or review to other members of the relevant ABJHI Project Scientific Committee.

3. Sub-protocols meeting initial approval by the Research Manager will be reviewed by the ABJHI Scientific Committee for scientific content (study design and investigator qualifications). Approval of sub-protocols by the Scientific Committee will require approval of the majority of voting members of the Scientific Committee in

attendance at a meeting (assumes quorum) or by the majority of committee members if submitted by e-mail, fax or mail. If approval is requested from the Scientific Committee by email, fax or mail a reasonable amount of time will be given for response (1 – 2 weeks) after which if no response is given it will be assumed that the protocol is approved by that committee member. The Scientific Committee can make recommendations on the appropriateness of the proposed protocol budget for the protocol.

4. The Scientific Committee will determine the resource cost impact of each sub-protocol which will be required to be provided by the principal sub-protocol applicant.

5. The proposed timeframe for the completion of the review and final approval decision on all protocols is 30 days.

Resources:

[None]

Attachments:

[None]

APPENDIX I

Oath of Confidentiality Security

ALBERTA
BONE & JOINT HEALTH
INSTITUTE

Oath of Confidentiality Security

Research Personnel with the Alberta Bone and Joint Health Institute will have access to recorded as well as non-recorded health information. It is expected that all employees will uphold his/her duties under the *Health Information Act* and Regulations and the custodians policies and procedures and that he/she will not disclose or make known any recorded or non-recorded health information of an individual except as authorized by the *Act*, the regulations and the custodian's policies and procedures.

All study information will be transmitted by the Research Personnel to Alberta Bone and Joint Health Institute Calgary office in a secure manner.

Failure to comply with this agreement will lead to immediate dismissal and further legal action as deemed appropriate in accordance with the *Health Information Act*.

I confirm that I have read, understood and will comply with the above directive regarding confidentiality.

Signed in Calgary, Alberta on this the 20th day of
October, in the year 2006.

Maoliosa Donald. M Donald.
Full Name (Printed) Signature

Katherine Gooch K Gooch
Research Manager Signature

COPY

CONFIDENTIALITY AGREEMENT

Between

Name Maoliosa Donald

Organization ____________________

("ORGANIZATION")

Address: 47 Coleridge Cres. NW.

City: Calgary

Province: AB

Post Code: T2K 1X8

and

The Alberta Bone and Joint Health Institute
200, 4520 16th Ave NW
Calgary, AB T3B 0M6
("ABJHI")

Effective the 20th **day of** October/**2006 ("EFFECTIVE DATE")**

The ABJHI has developed, possessed and will further develop confidential information consisting all or in part of protocol, data collection forms, data, budgets, procedures and other results and outcomes ("CONFIDENTIAL INFORMATION"), relating to the Research undertaken by the ABJHI.

The ABJHI desires to disclose to the ORGANIZATION some CONFIDENTIAL INFORMATION on a restricted and confidential basis, and the ORGANIZATION desires to receive this CONFIDENTIAL INFORMATION on a restricted and confidential basis and under the terms and conditions of this Agreement.

Now, therefore, in consideration of the foregoing premises, the ORGANIZATION and ABJHI agree as follows:

1. CONFIDENTIAL INFORMATION shall mean any and all written, oral and electronic information, communications, materials and documentation relating directly or indirectly to the ABJHI
2. In case of uncertainty whether information is CONFIDENTIAL INFORMATION, the ORGANIZATION shall treat the information as CONFIDENTIAL INFORMATION until a determination of whether the information is CONFIDENTIAL INFORMATION is made following consultation with the ABJHI

6

3. The ORGANIZATION agrees to take all reasonable and prudent precautions, and at least the same precautions it uses for its own CONFIDENTIAL INFORMATION in order to protect the CONFIDENTIAL INFORMATION disclosed by the ABJHI
4. The ORGANIZATION shall maintain the absolute confidentiality of CONFIDENTIAL INFORMATION and shall not disclose the same or any part thereof or obtain any benefit therefrom whatsoever directly or indirectly, without prior written consent of the ABJHI
5. The ORGANIZATION agrees that CONFIDENTIAL INFORMATION delivered to the ORGANIZATION by the ABJHI remains the sole property of the ABJHI. The ABJHI may, without notice, terminate this Agreement and require the prompt return of all CONFIDENTIAL INFORMATION provided to the ORGANIZATION including all electronic and paper copies made by the ORGANIZATION. The obligations of confidentiality under this agreement shall survive expiration of this agreement.
6. The ORGANIZATION agrees to not disclose CONFIDENTIAL INFORMATION received by the ABJHI to any third party without the written consent of the ABJHI. The ORGANIZATION agrees to advise all individuals within its organization who have access to CONFIDENTIAL INFORMATION of the provisions of the Agreement and shall require that all individuals within its organization abide by such confidentiality provisions.
7. The ORGANIZATION will not be obligated to keep confidential any CONFIDENTIAL INFORMATION that is publicly available or is approved for release by written authorization of the ABJHI
8. This Agreement shall be deemed to have been made in Alberta and shall be governed and construed in accordance with the laws of the Province of Alberta and the parties hereby submit to the jurisdiction of the Alberta Courts.
9. The above constitutes the full and complete Agreement in this matter by and between the Parties hereto

In witness whereof the parties have executed this Agreement below.

Alberta Bone and Joint Health Institute

By: **Katherine Gooch**

Signature: KGooch

Title: Research Manager
Alberta Bone and Joint Health Institute

Date: 27 Oct 06

Organization

By: Maolisa Donald

Signature: MDonald

Date: Oct 20th, 2006

APPENDIX J

Self Motivation Inventory (SMI) Short Version

UNIVERSITY OF CALGARY
FACULTY OF MEDICINE

ALBERTA BONE & JOINT HEALTH INSTITUTE

Alberta Arthroplasty Study

Self Motivation Questionnaire

Form

TO BE COMPLETED BY RESEARCHERS ONLY
Patient ID#: ____________-____________ Patient Initials: _____ _____ _____

What is today's date? |_|_|_|_|_|_| DAY MONTH YEAR

SELF MOTIVATION QUESTIONNAIRE

Please check only ONE answer.

1. I'm good at keeping promises, especially ones I make to myself.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

2. When I take on a difficult job I make a point of sticking with it until it is completed.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

3. I have a lot of self-motivation.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

4. I'm good at making decisions and standing by them.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

5. I work harder than most of my friends.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

6. Sometimes I push myself harder then I should.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

7. I like to take on jobs that challenge me.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

8. Whenever I reach a goal I set a higher one.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

9. I can persist in spite of failure.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

10. I have a strong desire to achieve.

☐ VERY UNLIKE ME ☐ SOMEWHAT UNLIKE ME ☐ NEITHER LIKE ME NOR UNLIKE ME ☐ SOMEWHAT LIKE ME ☐ VERY MUCH LIKE ME

APPENDIX K

SMI Short Version Written Permission

From: Rod Dishman <rdishman@coe.uga.edu>
Sent: Wednesday, March 16, 2005 12:19 pm
To: Maoliosa Donald <Maoliosa.Donald@CalgaryHealthRegion.ca>
Cc: Kathy Gooch <kgooch@ihe.ca>
Bcc:
Subject: Re: Self motivation Inventory
Attachments: SMI-10 questionnaire.pdf 11K SMI Info.pdf 495K SMI ms 09 04 03.pdf 28

Folks:

Here are the items and an early draft of the methods and results on the factorial validity of the 10-item version of the previously validated 40-item parent scale. You are welcome to use the items gratis for your research project, but please do not distribute them to others or use them for applied purposes. Some copyright information is also attached.

Good luck with your project, and I would be interested in learning of your results.

Regards

Rod K. Dishman
University of Georgia
Ramsey Student Center
300 River Road
Athens, GA 30602-6554
Phone 706-542-9840
FAX 706 542-3148

On Tue, 15 Mar 2005, Maoliosa Donald wrote:

> Dear Dr. Dishman,
> I am interested in using the Self Motivational Inventory in a provincial
> study here in Canada. The subjects would be arthroplasty patients. I
> found a 10 question version of your original tool in a study out of
> University of Texas - TIGER study. I have contacted the PI of this
> study regarding the 10 question inventory looking for the psychometric
> properties and scoring. They have directed me to you regarding the 10
> question tool. Can you be of assistance?
> Thanks in adavance for your help!
> Mo
>

APPENDIX L

Patient Questionnaires

****Package contains WOMAC and SF-36 – refer to highlighted sections**

ALBERTA
BONE & JOINT HEALTH
INSTITUTE

Patient Questionnaire

IMPORTANT POINTS TO REMEMBER WHEN COMPLETING THE QUESTIONNAIRE

- This package is double sided – please complete questions on both sides of the paper
- Please complete **EVERY** question
- Please mail back the completed questionnaire in the postage paid envelope as soon as possible
- If you have any questions please call 1-866-670-0886

ALBERTA BONE & JOINT HEALTH INSTITUTE

Last Name: ______________________________

First Name: ______________________________

Middle Initial: ______________________________

Orthopaedic Surgeon: ______________________________

Today's Date: ________ / ________ / ________
Day Month Year

Preferred Mailing Address and Phone Number:

Address:
____
____

City: ____________ **Prov.:** __________ **Postal Code:** ____________

Phone Number: ______________________________

Alternative Phone Number: ______________________

E-mail: ______________________________

How would you prefer to be contacted for future follow-ups?

☐ EMAIL ☐ TELEPHONE ☐ MAIL

ALBERTA BONE & JOINT HEALTH INSTITUTE

Alberta Hip and Knee Project
Patient Questionnaire Forms

PATIENT INFORMATION

Gender: ☐ MALE ☐ FEMALE

What is your birth date? ______/______/______
DAY MONTH YEAR

Height: ____________ **Weight :** ____________ ☐ Pounds ☐ Kilograms

What is your race?
☐ CAUCASIAN/ WHITE
☐ AFRICAN AMERICAN
☐ NATIVE AMERICAN
☐ EAST INDIAN
☐ ASIAN OR PACIFIC-ISLANDER
☐ HISPANIC
☐ OTHER: ____________
☐ PREFER NOT TO SAY

What is your marital status?
☐ SINGLE / NOT EVER MARRIED ☐ MARRIED ☐ PARTNER / COMMON LAW ☐ SEPARATED
☐ DIVORCED ☐ WIDOWED ☐ PREFER NOT TO SAY

HOMECARE

Do you receive care by others to help you at home? ☐ YES ☐ NO

If YES, check all that apply.
☐ A FAMILY MEMBER ASSISTS ME AT HOME
☐ I AM IN A HOME-CARE PROGRAM
☐ I LIVE IN A NURSING HOME
☐ OTHER: ____________

EMPLOYMENT INFORMATION

Are you currently employed? ☐ YES ☐ NO ☐ RETIRED ☐ STUDENT ☐ HOMEMAKER

If you are currently employed: ☐ FULL TIME ☐ PART TIME

If Employed, current occupation: ____________________ ☐ PREFER NOT TO SAY

What is your annual household income?
☐ LESS THAN $20,000 ☐ $20,000 - $40,000 ☐ $40,000 - $60,000 ☐ $60,000 - $80,000
☐ $80,000 – $100,000 ☐ MORE THAN $100,000 ☐ PREFER NOT TO SAY

Updated: 22 March, 2005

If you are currently employed, in the past year approximately how many days did you have to take off work because of your HIP OR KNEE condition? ______________ ☐ NONE ☐ N/A

Did you take any Short-term Disability days?

☐ YES ☐ NO If yes, how many? __________

Did you take any Long-term Disability days?

☐ YES ☐ NO If yes, how many? __________

MEDICATION INFORMATION

What is your current coverage for prescription medications?

☐ NONE ☐ GOVERNMENT ☐ EMPLOYER PAID ☐ PRIVATE COVERAGE

☐ SPOUSE EMPLOYER PAID ☐ OTHER: __________ ☐ UNKNOWN

Please list ALL of the medications you are currently taking only for your HIP OR KNEE condition. Please list all medications prescribed by your physician as well as any over the counter or herbal medications (e.g., Advil). The DOSAGE is especially important. HINT: It is easier to copy this information directly from your medication bottles.

☐ None

MEDICATION NAME	START DATE (month - year)	[illegible]	Approximately how many tablets per day

Please list ALL of the other PRESCRIPTION medications you are taking for any other health problem e.g., high blood pressure, depression. Hint: It is easier to copy this information directly from your prescription bottle.

☐ None

MEDICATION NAME	REASON (e.g., high blood pressure)	Dose per tablet or injection	Approximately how many tablets per day

OTHER HEALTHCARE INFORMATION

In the past year, did you visit any of the following healthcare providers for your HIP OR KNEE condition? If yes, please estimate the number of visits you had in the past year. Please answer every question.

Physiotherapist: ☐ YES ☐ NO Approx. number of visits in past year: ________

Chiropractor: ☐ YES ☐ NO Approx. number of visits in past year: ________

Herbalist: ☐ YES ☐ NO Approx. number of visits in past year: ________

Acupuncturist: ☐ YES ☐ NO Approx. number of visits in past year: ________

Massage: ☐ YES ☐ NO Approx. number of visits in past year: ________

Other: __________ ☐ YES ☐ NO Approx. number of visits in past year: ________

Other: __________ ☐ YES ☐ NO Approx. number of visits in past year: ________

JOINT REPLACEMENT HISTORY

In the past, have you ever had surgery for the following JOINT REPLACEMENTS

SHOULDER REPLACEMENT

☐ YES ☐ NO If Yes, ☐ LEFT ☐ RIGHT ☐ BOTH Year(s): ____________

HIP REPLACEMENT

☐ YES ☐ NO If Yes, ☐ LEFT ☐ RIGHT ☐ BOTH Year(s): ____________

KNEE REPLACEMENT

☐ YES ☐ NO If Yes, ☐ LEFT ☐ RIGHT ☐ BOTH Year(s): ____________

OTHER JOINT REPLACEMENT

☐ YES ☐ NO If Yes, ☐ LEFT ☐ RIGHT ☐ BOTH Year(s): ____________

OTHER HEALTH INFORMATION

Have you ever smoked cigarettes?

☐ NO, NEVER

☐ YES, IN THE PAST

YEAR QUIT: __________

APPROXIMATE NUMBER SMOKED EACH DAY: ______

APPROXIMATE NUMBER OF YEARS YOU SMOKED: ______

☐ YES, I CURRENTLY SMOKE

YEAR STARTED: __________

APPROXIMATE NUMBER OF CIGARETTES YOU SMOKE PER DAY: ______

Current alcohol consumption

What type and amount of alcoholic beverage(s) do you consume in an average WEEK? ☐ N/A ☐ PREFER NOT TO SAY

	YES	NO	AMOUNT CONSUMED
BEER	☐	☐	BOTTLES ______ CANS ______ GLASSES ______
WHITE WINE	☐	☐	GLASSES ______
RED WINE	☐	☐	GLASSES ______
LIQUOR	☐	☐	COCKTAILS ______ HIGHBALLS ______
OTHER	☐	☐	____________________

Do you have any of the following problems?

NOTE: If you receive any medications for the following health conditions, please ensure they are listed in the medication table on PAGE 3

1. HEART DISEASE (e.g. congestive heart failure, heart murmur, valve disease).

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ____________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

2. HIGH BLOOD PRESSURE

☐ YES ☐ NO

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

3. LUNG DISEASE (e.g. ASTHMA, COPD, EMPHYSEMA)

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ____________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

4. DIABETES

☐ YES ☐ NO IF YES, YEAR OF ONSET: __________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

5. STOMACH ULCERS OR GASTROINTESTINAL DISEASE (e.g., Crohn's disease, irritable bowel syndrome)

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ____________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

6. LIVER DISEASE (e.g., hepatitis, cirrohsis)

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ____________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

7. KIDNEY DISEASE

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ______________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Are you currently receiving dialysis? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

8. ANEMIA OR OTHER BLOOD DISEASES

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ______________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

9. CANCER

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ______________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

10. DEPRESSION OR ANXIETY

☐ YES ☐ NO

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

11. BACK PAIN

☐ YES ☐ NO

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

12. THYROID DISEASE

☐ YES ☐ NO IF YES, PLEASE SPECIFY: ______________________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

13. OTHER HEALTH PROBLEMS (please write in)

☐ YES ☐ NO OTHER PROBLEMS IF YES, PLEASE SPECIFY: ______________

If YES, Do you currently receive treatment for it? ☐ YES ☐ NO

Does it limit your activities? ☐ YES ☐ NO

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QUALITY OF LIFE INFORMATION

The questions on the next 6 pages ask you about your GENERAL HEALTH, i.e., not only your hip or knee condition. Please answer them with consideration of your overall health.

In general, how would you say your health is (please check one box)?

☐ EXCELLENT ☐ VERY GOOD ☐ GOOD ☐ FAIR ☐ POOR

Compared to one year ago, how would you rate your health in general now? (please check one box only)

☐ MUCH BETTER THAN ONE YEAR AGO ☐ SOMEWHAT BETTER THAN ONE YEAR AGO

☐ ABOUT THE SAME AS ONE YEAR AGO ☐ SOMEWHAT WORSE THAN ONE YEAR AGO

☐ MUCH WORSE THAN ONE YEAR AGO

The following questions are about the activities you might do in a typical day. Does your health limit you in the following activities? If so, by how much? (please check mark "√" ONE box for each question)

Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports?	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Moderate activities such as moving a table, pushing a vacuum cleaner, bowling or playing golf	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Lifting or carrying groceries	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Climbing several flights of stairs	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Climbing one flight of stairs	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Bending, kneeling, or stooping	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Walking more than one mile	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Walking several blocks	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Walking one block	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL
Bathing or dressing yourself	☐ LIMITED A LOT	☐ LIMITED A LITTLE	☐ NOT LIMITED AT ALL

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

Cut down on the amount of time you spent on work or other activities?	☐ YES	☐ NO
Accomplished less than you would like?	☐ YES	☐ NO
Were limited in the kind of work or other activities?	☐ YES	☐ NO
Had difficulty performing the work or other activities (for example, it took extra effort)?	☐ YES	☐ NO

During the past 4 weeks, have you had any of the following problems with your work or other regular activities as a result of any emotional problems (for example, feeling depressed or anxious)?

Cut down on the amount of time you spent on work or other activties?	☐ YES	☐ NO
Accomplished less than you would like?	☐ YES	☐ NO
Didn't do work or other activities as carefully as usual?	☐ YES	☐ NO

During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours or groups? (please check one box only)

☐ NOT AT ALL ☐ SLIGHTLY ☐ MODERATELY ☐ QUITE A BIT ☐ EXTREMELY

How much physical pain have you had during the past 4 weeks? (please check one box only)

☐ NONE ☐ VERY MILD ☐ MILD ☐ MODERATE ☐ SEVERE ☐ VERY SEVERE

During the past 4 weeks, how much pain interfered with your normal work, including both work outside the home and housework? (please check one box only)

☐ NOT AT ALL ☐ SLIGHTLY ☐ MODERATELY ☐ QUITE A BIT ☐ EXTREMELY

These questions are about how you feel and how things have been with you during the past 4 weeks. Please circle only one number per question.

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
Did you feel full of life?	1	2	3	4	5	6
Have you been a very nervous person?	1	2	3	4	5	6
Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
Have you felt calm and peaceful?	1	2	3	4	5	6
Did you have a lot of energy?	1	2	3	4	5	6
Have you felt downhearted and blue?	1	2	3	4	5	6
Did you feel worn out?	1	2	3	4	5	6
Have you been a happy person?	1	2	3	4	5	6
Did you feel tired?	1	2	3	4	5	6

During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities, like visiting friends or relatives etc.? Please check one box only.

☐ ALL OF THE TIME ☐ MOST OF THE TIME ☐ SOME OF THE TIME ☐ A LITTLE OF THE TIME ☐ NONE OF THE TIME

How TRUE or FALSE is each of the following statements for you?

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
I seem to get sick a little easier than other people	1	2	3	4	5
I am as healthy as anybody	1	2	3	4	5
I expect my health to get worse	1	2	3	4	5
My health is excellent	1	2	3	4	5

INSTRUCTIONS: This set of questions asks you for your views about different areas of your health. Please **READ EVERY ANSWER FIRST** before choosing the **BEST ONE ANSWER** only. If you are unsure about how to answer a question, please give the best answer you can.

VISION

☐ I AM ABLE TO SEE WELL ENOUGH TO READ ORDINARY NEWSPRINT AND RECOGNIZE A FRIEND ON THE OTHER SIDE OF THE STREET WITHOUT GLASSES OR CONTACT LENSES

☐ I AM ABLE TO SEE WELL ENOUGH TO READ ORDINARY NEWSPRINT AND RECOGNIZE A FRIEND ON THE OTHER SIDE OF THE STREET, BUT WITH GLASSES

☐ I AM ABLE TO READ ORDINARY NEWSPRINT WITH OR WITHOUT GLASSES BUT UNABLE TO RECOGNIZE A FRIEND ON THE OTHER SIDE OF THE STREET, EVEN WITH GLASSES

☐ I AM ABLE TO RECOGNIZE A FRIEND ON THE OTHER SIDE OF THE STREET WITH OR WITHOUT GLASSES BUT UNABLE TO READ ORDINARY NEWSPRINT, EVEN WITH GLASSES

☐ I AM UNABLE TO READ ORDINARY NEWSPRINT AND UNABLE TO RECOGNIZE A FRIEND ON THE OTHER SIDE OF THE STREET, EVEN WITH GLASSES

☐ I AM UNABLE TO SEE AT ALL

HEARING

☐ I AM ABLE TO HEAR WHAT IS SAID IN A GROUP CONVERSATION WITH AT LEAST THREE OTHER PEOPLE WITHOUT A HEARING AID

☐ I AM ABLE TO HEAR WHAT IS SAID IN A CONVERSATION WITH ONE OTHER PERSON IN A QUIET ROOM WITHOUT A HEARING AID, BUT REQUIRE A HEARING AID TO HEAR WHAT IS SAID IN A GROUP CONVERSATION WITH AT LEAST THREE OTHER PEOPLE

☐ I AM ABLE TO HEAR WHAT IS SAID IN A CONVERSATION WITH ONE OTHER PERSON IN A QUIET ROOM WITH A HEARING AID, AND ABLE TO HEAR WHAT IS SAID IN A GROUP CONVERSATION WITH AT LEAST THREE OTHER PEOPLE, WITH A HEARING AID

☐ I AM ABLE TO HEAR WHAT IS SAID IN A CONVERSATION WITH ONE OTHER PERSON IN A QUIET ROOM, WITHOUT A HEARING AID, BUT UNABLE TO HEAR WHAT IS SAID IN A GROUP CONVERSATION WITH AT LEAST THREE OTHER PEOPLE EVEN WITH A HEARING AID

☐ I AM ABLE TO HEAR WHAT IS SAID IN A CONVERSATION WITH ONE OTHER PERSON IN A QUIET ROOM WITH A HEARING AID, BUT UNABLE TO HEAR WHAT IS SAID IN A GROUP CONVERSATION WITH AT LEAST THREE OTHER PEOPLE EVEN WITH A HEARING AID

☐ I AM UNABLE TO HEAR AT ALL

SPEECH

☐ I AM ABLE TO BE UNDERSTOOD COMPLETELY WHEN SPEAKING WITH STRANGERS OR FRIENDS

☐ I AM ABLE TO BE UNDERSTOOD PARTIALLY WHEN SPEAKING WITH STRANGERS BUT ABLE TO BE UNDERSTOOD COMPLETELY WHEN SPEAKING TO PEOPLE WHO KNOW ME WELL

☐ I AM ABLE TO BE UNDERSTOOD PARTIALLY WHEN SPEAKING WITH STRANGERS OR PEOPLE WHO KNOW ME WELL

☐ I AM UNABLE TO BE UNDERSTOOD WHEN SPEAKING WITH STRANGERS BUT ABLE TO BE UNDERSTOOD PARTIALLY BY PEOPLE WHO KNOW ME WELL

☐ I AM UNABLE TO BE UNDERSTOOD WHEN SPEAKING TO OTHER PEOPLE (OR UNABLE TO SPEAK AT ALL)

AMBULATION

☐ I AM ABLE TO WALK AROUND THE NEIGHBOURHOOD WITHOUT DIFFICULTY, AND WITHOUT WALKING EQUIPMENT

☐ I AM ABLE TO WALK AROUND THE NEIGHBOURHOOD WITH DIFFICULTY, BUT DO NOT REQUIRE WALKING EQUIPMENT OR THE HELP OF ANOTHER PERSON

☐ I AM ABLE TO WALK AROUND THE NEIGHBOURHOOD WITH A WALKING EQUIPMENT, BUT WITHOUT THE HELP OF ANOTHER PERSON

☐ I AM ABLE TO WALK ONLY SHORT DISTANCES WITH WALKING EQUIPMENT, AND REQUIRES A WHEELCHAIR TO GET AROUND THE NEIGHBOURHOOD

☐ I AM UNABLE TO WALK ALONE, EVEN WITH WALKING EQUIPMENT. I AM ABLE TO WALK SHORT DISTANCES WITH THE HELP OF ANOTHER PERSON, AND REQUIRE A WHEELCHAIR TO GET AROUND THE NEIGHBOURHOOD

☐ I AM UNABLE TO WALK AT ALL

DEXTERITY

☐ I HAVE FULL USE OF MY TWO HANDS AND TEN FINGERS

☐ I HAVE LIMITATIONS IN THE USE OF MY HANDS AND FINGERS, BUT DO NOT REQUIRE SPECIAL TOOLS OR HELP OF ANOTHER PERSON

☐ I HAVE LIMITATIONS IN THE USE OF MY HANDS OR FINGERS, AND AM INDEPENDENT WITH THE USE OF SPECIAL TOOLS (DO NOT REQUIRE THE HELP OF ANOTHER PERSON)

☐ I HAVE LIMITATIONS IN THE USE OF MY HANDS OR FINGERS AND REQUIRE THE HELP OF ANOTHER PERSON FOR SOME TASKS

☐ I HAVE LIMITATIONS IN THE USE OF MY HANDS OR FINGERS AND REQUIRE THE HELP OF ANOTHER PERSON FOR MOST TASKS

☐ I HAVE LIMITATIONS IN THE USE OF MY HANDS OR FINGERS AND REQUIRE THE HELP OF ANOTHER PERSON FOR ALL TASKS

EMOTION

☐ I AM HAPPY AND INTERESTED IN LIFE

☐ I AM SOMEWHAT HAPPY

☐ I AM SOMEWHAT UNHAPPY

☐ I AM VERY UNHAPPY

☐ I AM SO UNHAPPY THAT I FEEL LIFE IS NOT WORTHWHILE

COGNITION

☐ I AM ABLE TO REMEMBER MOST THINGS, THINK CLEARLY AND SOLVE DAY TO DAY PROBLEMS

☐ I AM ABLE TO REMEMBER MOST THINGS, BUT HAVE DIFFICULTY WHEN TRYING TO THINK AND SOLVE DAY TO DAY PROBLEMS

☐ I AM SOMEWHAT FORGETFUL, BUT AM ABLE TO THINK CLEARLY AND SOLVE DAY TO DAY PROBLEMS

☐ I AM SOMEWHAT FORGETFUL AND HAVE A LITTLE DIFFICULTY WHEN TRYING TO THINK OF SOLVE DAY TO DAY PROBLEMS

☐ I AM VERY FORGETFUL AND HAVE GREAT DIFFICULTY WHEN TRYING TO THINK OR SOLVE DAY TO DAY PROBLEMS

☐ I AM UNABLE TO REMEMBER ANYTHING AT ALL, AND UNABLE TO THINK OR SOLVE DAY TO DAY PROBLEMS

PAIN

☐ I AM FREE OF PAIN AND DISCOMFORT

☐ I HAVE MILD TO MODERATE PAIN THAT PREVENTS NO ACTIVITIES

☐ I HAVE MODERATE PAIN THAT PREVENTS A FEW ACTIVITIES

☐ I HAVE MODERATE TO SEVERE PAIN THAT PREVENTS SOME ACTIVITIES

☐ I HAVE SEVERE PAIN THAT PREVENTS MOST ACTIVITIES

WOMAC

The questions on the next 3 pages are specific to your HIP OR KNEE condition.

The following questions concern the amount of pain you have experienced due to arthritis in your HIP/KNEE joint(s).. For each situation please enter the amount of PAIN experienced in the last 48 hours. Please check **ONE BOX ONLY** for each question.

Walking on a flat surface

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Going up or down stairs

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

At night while in bed

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Sitting or lying

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Standing upright

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

The following questions concern the amount of joint stiffness (not pain) you have experienced due to arthritis in your HIP/KNEE joint(s). Stiffness is a sensation of restriction or slowness in the ease with which you move your hip/knee joint. For each situation please enter the amount of STIFFNESS experienced in the last 48 hours. Please check **ONE BOX ONLY** for each question.

How severe is your stiffness after first wakening in the morning?

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

How severe is your stiffness after sitting, lying or resting later in the day?

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

The following questions concern your **PHYSICAL FUNCTION.** By this we mean your ability to move around and look after yourself. For each of the following activities, please indicate the degree of difficulty you have experienced in the last 48 hours due to your arthritis in your HIP/ KNEE joint(s). Please check **ONE BOX ONLY** for each question.

Descending stairs

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Ascending stairs

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Rising from sitting

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Standing

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Bending to the floor

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Walking on a flat surface

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Getting in or out of a car

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Going shopping

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Putting on socks or stockings

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Rising from bed

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Taking off socks or stockings

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Lying in bed

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Getting in or out of a bath

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Sitting

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Getting on or off a toilet

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Heavy domestic duties

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

Light domestic duties

☐ NONE ☐ MILD ☐ MODERATE ☐ SEVERE ☐ EXTREME

PHYSICAL ACTIVITY INFORMATION

INSTRUCTIONS: This set of questions asks you for your views about your physical activity. Your answers to these questions should reflect your level of activity in a TYPICAL WEEK. If you are unsure about how to answer a question, please give the best answer you can.

REST AND ACTIVITY FOR A TYPICAL DAY (Please note that your answers should total 24 hours)	Approximate number of hours per day
THE NUMBER OF HOURS THAT YOU TYPICALLY SLEEP	______
THE NUMBER OF HOURS YOU ARE TYPICALLY SITTING	______
THE NUMBER OF HOURS WITH SLIGHT ACTIVITY (e.g. standing or walking)	______
THE NUMBER OF HOURS WITH MODERATE ACTIVITY (e.g. housework, vacuum, dusting, yard chores, climbing stairs, light sports such as golf or bowling)	______
THE NUMBER OF HOURS WITH HEAVY ACTIVITY (e.g. heavy yard work such as chopping or stacking wood, intensive sports such as jogging or swimming)	______
TOTAL HOURS	24

What is your normal walking pace outdoors? (Please check one box only)

☐ UNABLE TO WALK
☐ EASY, CASUAL, SLOW
☐ NORMAL, AVERAGE

☐ BRISK PACE
☐ VERY BRISK PACE
☐ UNKNOWN

Approximately how many flights of stairs (not steps) do you climb daily? (estimated 10 steps per flight) Please check one box only.

☐ NO FLIGHTS ☐ 1 - 2 FLIGHTS ☐ 3 - 4 FLIGHTS ☐ 5 - 9 FLIGHTS ☐ 10 - 14 FLIGHTS
☐ MORE THAN 15 FLIGHTS ☐ UNKNOWN

During the PAST YEAR what was you average time PER WEEK spent in each of the following activities? Please check one box only for each activity.

Walking for exercise or walking to work

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Jogging (slower than a 10 minute mile)

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Running (10 minutes per mile or faster)

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Bicycling (including stationary bike)

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Tennis, squash or racketball

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Lap swimming

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Other aerobic exercise (aerobic dance, skiing, stair machine, rowing)

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Lower intensity exercise (yoga, pilates, stretching)

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Other vigorous exercise (lawnmowing)

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 50 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Weight training including free weights or weight machines

☐ NO TIME ☐ 1 - 4 MINUTES ☐ 5 - 19 MINUTES ☐ 20 - 59 MINUTES ☐ I HOUR
☐ 1 - 1.5 HOURS ☐ 2 - 3 HOURS ☐ 4 - 6 HOURS ☐ 7 - 10 HOURS ☐ MORE THAN 11 HOURS

Please list any other activities that you do that are not listed above, and the approximate time you spend per week participating in these activities

☐ **I do not participate in any other activities**

Activity	Time per week	[illegible]

APPENDIX M

Data Coding Table

APPENDIX M

Name	Label	Value
Joint	Joint	1: Hip 2: Knee
Agecategory	Agecat	1: 40 – 59 2: 60 – 69 3: 70 – 79 4: ≥ 80
Income		1: Low 2: Medium 3: High
Gender	Gender	0: male 1: female
Marriage	Marriage	0: No 1: Yes
Length of stay	LOS	days
Chronic disease score	CDS	Number
Body Mass Index	BMI	Number
WOMAC score	WOMAC	Number
SF 36 Physical Function	SF36 PF	Number
SF 36 Mental Health	SF36 MH	Number
SMI score	SMI	Number
Received support	Homecafami	0: No 1: Yes
Stairs	Stairs	0: No 1: Yes
Bedroom	Bedroom	0: No 1: Yes